

1487. aa. 2.

THE
Mariners Compass
RECTIFIED.

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 Pilots and Sea-Charts for all Parts of the World, *Plain and*
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T H E

Mariner's Compass

R E C T I F I E D

Containing TABLES, shewing the true Hour of the Day, the Sun being upon any Point of the Compass: With the true Time of the *Rising* and *Setting* of the *Sun* and *Stars*, and the Points of the *Compass* that the *Sun* and *Stars* rise and set with: And Tables of *Amplitude*. All which Tables are Calculated from the *Equinoctial* to 60 deg. of *Latitude*, &c.

With the Description and Use of those Instruments most in Use in the Art of *Navigation*.

Also a TABLE of the *Latitude* and *Longitude* of Places:

By Andrew Wakely, *Math. School*
Carefully Corrected, and very much Enlarged,
with many useful Additions.

By Ja Atkinson, Teacher of the Mathematics,

L O N D O N :

Printed for Rich. Mount, in *Postern Row*, on *Tower-Hill*,
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Advertisement.

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Trigonometry,	Gunnery,
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By **JAMES ATKINSON.**

There are also made and sold all sorts of Mathematical Instruments, in Wood or Brass, for Sea or Land, with Books to shew the Use of them. Where also you may have all sorts of Maps, Plans, Sea-Charts, in Plain or Mercator, at Reasonable Rates.



To the READER.

Courteous Reader,

WHEN I first enter'd upon these my Labours, and after I had begun the Calculation, I found, that tho' the Book be small, yet my Labour was so great, that I almost fainted. Yet at length, when I considered the ordinary, necessary, and frequent Use that might be made of these my Labours, I was thereby encouraged to go on and prosecute my Work; and how ready and easie I have made it for actual Performance, will plainly appear, by immediate inspection, to the meanest Capacity.

Here follows a Brief Explanation of the Method and Order of the Book. First you will find Tables of the Sun's Declination, newly Calculated from the best Hypothesis yet discovered, and applied to the Meridian of London, whose Latitude is 51d. 32m. North, and Longitude according to my Table 00d. 00m. Next you will find Tables shewing the True Hour and Minute of the Day, the Sun being upon any Point of the Compass; which Tables are as Dials, fitting all Places in th^e World, whose Pole is elevated, not above 60 deg. either North or South. Likewise by these Tables you may know the True Hour and Minute of the Night, by the bearing of any of the known Fixed Stars between the Tropicks. Then you will find Tables shewing the True Time of the Sun's Rising, and Setting, with the Length of the Day and Night. Also by these Tables you may find the True Time of Rising and Setting of all the eminent Fixed Stars between the

Tropicks. Next you will find Tables shewing the Points of the Compass that the Sun and all the above said Stars Rise and Set with; which Tables are of excellent use for the ready Finding of the Variation of the Compass, and may be performed by a Meridian Compass that is about Ten Inches in Diameter whose Points being divided into Halfs and Quarters such a Compass I suppose to be convenient for the Mariners Use, where he hath not an Azimuth Compass. Next you will find Tables of Amplitudes to every Degree of the Sun's Declination: All these Tables are calculated from the Equinoctial to Sixty Degrees of Latitude, either North or South; and they will last with Exactness as long as God upholdeth the Order and Course of Nature.

In the Appendix you will find the use of all those Instruments that are most in use in the Art of Navigation, either for Operation, or Observation. Likewise a Table containing the most and chiefest Harbours, Headlands, and Islands in the World; shewing the Latitude, and Longitude of each of them; beginning the Longitude at the Meridian of London newly Composed in a new successive Order.

This Method I own, but how I have acquitted myself therein, I shall leave to the Judgment and Experiments of the Skillfullest Mariners that the World affords, which are my native Countrymen of England

Fare ever well, so wishes he;

Who is more yours, than he can seem to be,

Andrew Wakeley

The Corrector to the Reader.

Candid Reader,

BEING desired by the Bookseller concerned herein, I willingly undertook the Viewing and Correcting of this Treatise, (and the rather for that Respect I bear to the Memory of my Master the deceased Author) which for its Usefulness hath obtained good Esteem with our *Navigators*; I therefore have took the greater Pains, spent much Time, in examining each Table, correcting, mending, altering, explaining, and enlarging where I saw Cause: Having endeavoured to render the whole of the *Mariners Compass Rectified* most familiar, and easy to an ordinary Capacity.

In this Edition, I have contracted the *Tables of Amplitudes in Points of the Compass*, and yet as intelligible as before; by which having made more Room, I have made the *Reader* amends with large Additions in the *Use* of each Table, and methodising the Discourse thro' out: But more especially in the *Use of Instruments*; I have taken Liberty to Repair, Alter, and Enlarge; that it will appear as good as new; but chiefly in the *Description and Use of the Gunner, Sliding-Gunter, and Sector*: principally the two former; whose *Uses* I have shew'd in *Arithmetick*, to *Multiply, Divide, and work the Rule of Three*; in *Geometry*, to work *Proportions, Continual, Duplicate, and Triplicate*;

Mensuration of Superficies, and Solids; as to measure Board, Timber, Stone, Gauging of Vessels, Tunaging of Ships, Bales, or Boxes; Also in Gunnery, in Navigation, both in Plain, and Mercators Sailing: In Astronomy, the most useful Problems; to find the Sun's Place, Declination, Rising, Setting, Amplitude, Azimuth, Hour, and Altitude at all times. And in all, you are directed plainly to perform them, both by Sliding-Gunter, and with Compasses.

In the *Table of Latitude, and Longitude*, I have added many Places of Note, and omitted some few that were of little Moment, and have corrected both the Latitudes and Longitudes of the most Eminent, according to the latest Observations: So that I am bold to say, it's the most exact Table of its kind extant.

These, with many other *Additions*, thro' the whole, I hope will find acceptance with *Young Students* in the *Mathematicks*, and prove serviceable to them, both in their *Studies*, and *Practice of Navigation*, and other Parts of the *Mathematicks*: For whose Sakes I took the greater Pains herein, who am an obliged Servant to teach them what may here be wanting.

Rotherhitb-Wall,
8th Sept.
1693.

James Atkinson.

EXACT

EXACT

TABLES

Of the SUN'S

DECLINATION:

Calculated from the best *Hypothesis* yet Discovered, and applied to the *Meridian* of *LONDON*.

Whose $\left\{ \begin{array}{l} \text{Latitude} \\ \text{Longitude} \end{array} \right\}$ is $\left\{ \begin{array}{l} \text{D.} \\ \text{M.} \end{array} \right\} \begin{array}{l} 51 : 32 \text{ North.} \\ 00 : 00 \end{array}$

*The Mariners Compass Rectified.**First after Leap-Year.*

Sun's Declination, 1717, 1721, 1725, 1729, 1733.

Days.	South.		Febr.		March.		April.		May.		June.	
	Januar.		South.		South.		North.		North.		North.	
1	21	39	13	39	03	17	08	43	18	09	23	11
2	21	28	13	19	02	53	09	05	18	24	23	15
3	21	18	12	50	02	29	09	26	18	39	23	18
4	21	07	12	38	02	05	09	47	18	53	23	21
5	20	56	12	17	01	42	10	09	19	07	22	23
6	20	44	11	56	01	18	10	30	19	21	23	25
7	20	32	11	35	00	54	10	51	19	34	23	27
8	20	19	11	14	00	31	11	12	19	47	23	28
9	20	06	10	53	00	07	11	32	20	00	23	29
10	19	53	10	31	Not. 16		11	53	20	12	23	29
11	19	38	10	09	00	40	12	13	20	25	23	29
12	19	25	09	47	01	04	12	33	20	36	23	29
13	19	11	09	25	01	27	12	53	20	48	23	28
14	18	56	09	03	01	51	13	13	20	59	23	27
15	18	41	08	40	02	14	13	32	21	09	23	25
16	18	26	08	18	02	38	13	51	21	19	23	23
17	18	10	07	55	03	01	14	10	21	29	23	20
18	17	54	07	32	03	25	14	29	21	39	23	17
19	17	38	07	10	03	48	14	47	21	48	23	14
20	17	21	06	47	04	11	15	06	21	57	23	10
21	17	04	06	24	04	34	15	24	22	05	23	06
22	16	47	06	01	04	57	15	42	22	13	23	01
23	16	29	05	37	05	20	15	59	22	21	22	56
24	16	12	05	14	05	43	16	16	22	28	22	51
25	15	53	04	51	06	06	16	33	22	35	22	45
26	15	39	04	27	06	29	16	50	22	41	22	39
27	15	16	04	04	06	51	17	06	22	47	22	32
28	14	57	03	40	07	14	17	23	22	53	22	25
29	14	38			07	36	17	38	22	58	22	18
30	14	19			07	58	17	54	23	03	22	10
31	13	52			08	21			23	07		

The Mariners Compass Rectified.

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First after Leap-Year.

Sun's Declination 1717, 1721, 1725, 1729, 1733.

Day.	July.		August.		Septem.		October.		Novem.		Decemb.	
	North		North		North		South.		South.		South.	
1	22	02	15	02	04	12	27	25	17	46	23	08
2	21	53	14	44	03	49	07	48	18	02	23	12
3	21	44	14	35	03	36	08	10	18	18	23	16
4	21	35	14	07	03	03	08	33	18	33	23	20
5	21	25	13	48	02	40	08	55	18	48	23	22
6	21	15	13	29	02	16	09	17	19	03	23	24
7	21	05	13	09	01	53	09	39	19	18	23	26
8	20	54	12	50	01	30	10	01	19	32	23	28
9	20	43	12	30	01	06	10	23	19	46	23	29
10	20	33	12	10	00	43	10	44	19	59	23	29
11	20	20	11	50	00	19	11	06	20	12	23	29
12	20	08	11	30	00	04	11	27	20	25	23	29
13	19	56	11	09	Sou.	27	11	48	20	37	23	27
14	19	44	10	48	00	51	12	09	20	49	23	26
15	19	30	10	28	01	14	12	29	21	01	23	24
16	19	17	10	17	01	38	12	50	21	12	23	22
17	19	04	09	43	02	01	13	19	21	22	23	19
18	18	49	09	24	02	25	13	30	21	33	23	16
19	18	34	09	03	02	48	13	40	21	43	23	12
20	18	20	08	41	03	12	14	10	21	52	23	08
21	18	05	08	19	03	36	14	20	22	01	23	03
22	17	50	07	57	03	58	14	48	22	10	22	58
23	17	34	07	35	04	22	15	07	22	18	22	52
24	17	18	07	13	04	45	15	26	22	26	22	46
25	17	02	06	51	05	08	15	44	22	34	22	39
26	16	46	06	28	05	31	16	03	22	41	22	32
27	16	29	06	06	05	54	16	20	22	47	22	25
28	16	12	05	43	06	17	16	38	22	53	22	17
29	15	55	05	21	06	40	16	55	22	58	22	09
30	15	38	04	58	07	03	17	13	22	03	22	00
31	15	20	04	35			17	29	21		21	51

Second after Leap Year.

Sun's Declination, 1718, 1722, 1726, 1730, 1734.

Days.	Januar.		Febr.		March.		April		May.		June.	
	South.		South.		South.		North.		North.		North.	
1	21	41	13	44	03	21	08	37	18	06	23	10
2	21	31	13	24	02	59	08	59	18	21	23	14
3	21	21	13	04	02	35	09	21	18	35	23	17
4	21	16	12	43	02	11	09	42	18	50	23	20
5	20	59	12	22	01	48	10	03	19	04	23	23
6	20	47	12	01	01	24	10	25	19	18	23	25
7	20	35	11	40	01	00	10	46	19	31	23	26
8	20	22	11	19	00	37	11	07	19	44	23	28
9	20	10	10	58	00	13	11	27	19	57	23	29
10	19	56	10	36	Nor. 10		11	48	20	10	23	29
11	19	43	10	14	00	34	12	08	20	22	23	29
12	19	29	09	52	00	58	12	28	20	33	23	29
13	19	15	09	30	01	21	12	48	20	45	23	28
14	19	00	09	08	01	45	13	08	20	56	23	27
15	18	45	08	46	02	08	13	27	21	07	23	25
16	18	30	08	23	02	32	13	47	21	17	23	23
17	18	24	08	01	02	55	14	06	21	27	23	21
18	17	58	07	38	03	18	14	24	21	36	23	18
19	17	42	07	15	03	42	14	43	21	45	23	14
20	17	25	06	52	04	05	15	01	21	54	23	11
21	17	08	06	29	04	29	15	19	22	03	23	07
22	16	51	06	06	04	52	15	37	22	11	23	02
23	16	34	05	43	05	15	15	55	22	19	22	57
24	16	16	05	20	05	38	16	12	22	26	22	52
25	15	58	04	57	06	01	16	19	22	33	22	46
26	15	39	04	33	06	23	16	46	22	40	22	40
27	15	21	04	09	06	46	17	02	22	46	22	34
28	15	02	03	46	17	08	17	19	22	51	22	27
29	14	43			17	31	17	35	22	57	22	20
30	14	23			17	53	17	50	23	02	22	20
31	14	04			08	15			23	06		12

Second after Leap Year.

Sun's Declination 1718. 1722. 1726. 1730. 1734.

Days.	July.	August	Septem	October,	Novem.	Decemb
	North.	North.	North.	South.	South.	south.
1	22 04	15 06	04 18	07 20	17 42	23 07
2	21 54	14 48	03 55	07 42	17 58	23 11
3	21 46	14 30	03 32	08 05	18 14	23 15
4	21 37	14 11	03 08	08 27	18 29	23 19
5	21 28	13 52	02 45	08 50	18 45	23 22
6	21 18	13 33	02 22	09 12	18 59	23 24
7	21 08	13 14	01 59	09 34	19 14	23 26
8	20 57	12 54	01 35	09 56	19 28	23 28
9	20 46	12 35	01 12	10 17	19 42	23 28
10	20 35	12 15	00 48	10 40	19 56	23 29
11	20 23	11 55	00 25	11 00	20 09	23 29
12	20 11	11 35	00 02	11 22	20 22	23 29
13	19 59	11 14	Sou. 22	11 43	20 34	23 28
14	19 46	10 53	00 45	12 03	20 46	23 27
15	19 33	10 33	01 09	12 24	20 58	23 25
16	19 20	10 12	01 32	12 45	21 09	23 22
17	19 06	09 51	01 56	13 05	21 20	23 19
18	18 52	09 29	02 19	13 25	21 30	23 16
19	18 38	09 08	02 42	13 45	21 40	23 12
20	18 23	08 46	03 06	14 05	21 50	23 09
21	18 08	08 25	03 29	14 24	21 59	23 04
22	17 53	08 03	03 53	14 44	22 08	22 59
23	17 38	07 41	04 16	15 03	22 16	22 53
24	17 22	07 19	04 39	15 21	22 24	22 47
25	17 06	06 56	05 02	15 40	22 32	22 41
26	16 50	06 34	05 25	15 58	22 39	22 34
27	16 33	06 12	05 48	16 16	22 45	22 27
28	16 16	05 49	06 11	16 34	22 52	22 19
29	15 59	05 26	06 34	16 51	22 57	22 11
30	15 42	05 04	06 57	17 08	23 02	22 02
31	15 24	04 41		17 25		21 53

*The Mariners Compass Rectified.**Third Year after Leap-Year.*

Sun's Declination, 1719, 1723, 1727, 1731, 1735.

Days	January.		Februa.		March.		April.		May.		June.	
	South		South.		South.		North		North		North	
1	21	43	13	49	03	28	08	32	18	02	23	09
2	21	33	13	29	03	04	08	54	18	17	23	13
3	21	23	13	09	02	41	09	15	18	32	23	17
4	21	12	12	48	02	17	09	37	18	46	23	20
5	21	01	12	27	01	54	09	58	19	01	23	22
6	20	50	12	06	30	30	10	20	19	14	23	24
7	20	38	11	46	06	06	10	41	19	28	23	26
8	20	25	11	24	43	43	11	02	19	41	23	27
9	20	13	11	03	19	19	11	22	19	54	23	28
10	20	00	10	41	Nor.	05	11	43	20	06	23	29
11	19	46	10	20	06	28	12	03	20	18	23	29
12	19	32	19	58	00	52	12	23	20	30	23	29
13	19	18	09	36	01	16	12	43	20	42	23	28
14	19	04	09	14	01	39	13	03	20	53	23	27
15	18	49	08	51	02	03	13	23	21	04	23	25
16	18	33	08	29	02	26	13	42	21	14	23	23
17	18	18	08	06	02	40	14	01	21	24	23	21
18	18	02	07	44	03	13	14	20	21	34	23	18
19	17	46	07	21	03	36	14	39	21	43	23	15
20	17	29	06	58	04	00	14	57	21	52	23	12
21	17	13	06	35	04	23	15	15	22	01	23	08
22	16	55	06	12	04	46	15	33	22	09	23	03
23	16	38	05	49	05	09	15	51	22	17	22	58
24	16	20	05	25	05	32	16	08	22	24	22	53
25	16	02	05	02	05	55	16	25	22	31	22	48
26	15	44	04	39	06	18	16	42	22	38	22	42
27	15	25	04	15	06	40	16	58	22	44	22	35
28	15	07	03	52	07	03	17	15	22	50	22	28
29	14	48			07	25	17	31	22	55	22	21
30	14	28			07	48	17	46	23	00	22	14
31	14	09			08	10			23	05		

The Mariners Compass Rectified.

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Third after Leap Year.

Sun's Declination 1719. 1723. 1727. 1731. 1735.

Days.	July.		August		Septem		October.		Novem.		Decemb	
	North.		North.		North.		South.		South.		South.	
1	22	05	15	11	04	23	07	14	17	38	23	06
2	21	57	14	53	04	00	07	37	17	54	23	10
3	21	49	14	34	03	57	07	00	18	10	23	14
4	21	40	14	16	03	14	08	22	18	26	23	18
5	21	30	13	57	02	51	08	44	18	41	23	21
6	21	20	13	38	02	28	09	06	18	56	23	23
7	21	10	13	19	02	04	09	28	19	11	23	25
8	21	00	12	59	01	41	09	50	19	25	23	27
9	20	49	12	49	01	18	10	12	19	39	23	28
10	20	38	12	20	00	54	10	34	19	52	23	29
11	20	26	12	00	00	31	10	55	20	06	23	29
12	20	14	11	40	00	07	11	17	20	19	23	29
13	20	02	11	19	Sou.	16	11	38	20	31	23	28
14	19	49	10	59	00	39	11	59	20	43	23	27
15	19	36	10	38	01	03	12	19	20	55	23	25
16	19	23	10	17	01	26	12	40	21	06	23	23
17	19	09	09	56	01	50	13	00	21	17	23	20
18	18	57	09	35	02	13	13	21	21	28	23	17
19	18	41	09	13	02	37	13	40	21	38	23	14
20	18	27	08	52	03	00	14	00	21	48	23	10
21	18	12	08	30	03	24	14	25	21	57	23	05
22	17	57	08	08	03	47	14	39	22	06	23	00
23	17	42	07	46	04	10	14	58	22	14	22	55
24	17	26	07	24	04	33	15	17	22	22	22	49
25	17	10	07	02	04	57	15	35	22	30	22	43
26	16	54	06	40	05	20	15	54	22	37	22	36
27	16	37	06	17	05	43	16	18	22	44	22	28
28	16	20	05	55	06	06	16	29	22	50	22	21
29	16	03	05	32	06	29	16	47	22	56	22	13
30	15	46	05	09	06	52	17	04	23	01	22	04
31	15	28	04	46			17	21			21	55

Leap-Year.

Sun's Declination, 1720, 1724, 1728, 1732, 1736.

Day	Januar.		Februa.		March.		April.		May.		June.	
	South		South.		South.		North		North		North	
1	21	46	13	54	03	10	08	48	18	13	23	12
2	21	36	13	34	02	47	09	40	18	28	23	16
3	21	26	13	14	02	23	09	32	18	43	23	19
4	21	15	12	53	01	59	09	53	18	57	23	22
5	21	04	12	33	01	36	10	14	19	11	23	24
6	20	53	12	12	01	12	10	35	19	24	23	26
7	20	41	11	51	00	48	10	56	19	38	23	27
8	20	29	11	30	00	25	11	17	19	51	23	28
9	20	16	11	08	00	01	11	38	20	03	23	29
10	20	03	10	47	Nor. 23		11	48	20	16	23	29
11	19	50	10	25	00	46	12	19	20	28	23	29
12	19	36	10	03	01	10	12	38	20	39	23	28
13	19	22	09	41	01	34	12	58	20	50	23	27
14	19	07	09	19	01	57	13	18	21	01	23	26
15	18	52	08	57	02	21	13	37	21	12	23	24
16	18	37	08	34	02	44	13	56	21	22	23	22
17	18	21	08	12	03	08	14	15	21	32	23	19
18	18	06	07	49	03	31	14	34	21	41	23	16
19	17	50	07	26	03	54	14	52	21	50	23	12
20	17	34	07	03	04	17	15	11	21	59	23	09
21	17	17	06	40	04	41	15	28	22	07	23	04
22	17	00	06	17	05	04	15	46	22	15	23	59
23	16	42	05	54	05	27	16	04	22	23	22	54
24	16	25	05	31	05	49	16	21	22	30	22	49
25	16	07	05	08	06	12	16	38	22	36	22	43
26	15	48	04	44	06	35	16	54	22	43	22	37
27	15	30	04	21	06	57	17	11	22	49	22	30
28	15	11	03	57	07	20	17	27	22	54	22	23
29	14	52	03	34	07	42	17	43	22	58	22	16
30	14	33			08	04	17	58	23	04	22	08
31	14	13			08	26			23	08		

The Mariners Compass Rectified.

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Leap Year.

Sun's Declination 1720. 1724. 1728. 1732. 1736.

	July.	August	Septem	October,	Novem.	Decemb
	North.	North.	North.	South.	South.	South.
1	21 59	14 57	04 06	07 32	17 46	23 09
2	21 51	14 39	03 43	07 54	18 06	23 13
3	21 42	14 20	03 20	08 14	18 22	23 17
4	21 32	14 01	03 57	08 39	18 37	23 20
5	21 23	13 42	02 33	09 01	18 52	23 23
6	21 13	13 23	02 10	09 23	19 07	23 25
7	21 02	13 04	01 47	09 45	19 22	23 26
8	20 51	12 44	01 23	10 07	19 36	23 28
9	20 40	12 24	01 00	10 29	19 49	23 29
10	20 29	12 04	00 36	10 50	20 02	23 30
11	20 17	11 44	00 13	11 11	20 15	23 30
12	20 05	11 24	Sou. 10	11 33	20 28	23 30
13	19 53	11 04	00 34	11 54	20 40	23 30
14	19 39	10 43	00 57	12 14	20 52	23 30
15	19 26	10 22	01 21	12 35	21 03	23 30
16	19 13	10 01	01 44	12 55	21 15	23 30
17	18 59	09 40	02 08	13 16	21 25	23 30
18	18 45	09 18	02 31	13 36	21 35	23 30
19	18 30	08 57	02 55	13 55	21 45	23 30
20	18 16	08 35	03 18	14 15	21 54	23 30
21	18 01	08 13	03 41	14 34	22 03	23 30
22	17 45	07 52	04 05	14 54	22 12	23 30
23	17 30	07 29	04 28	15 12	22 20	23 30
24	17 14	07 07	04 51	15 31	22 28	23 30
25	16 58	06 45	05 14	15 49	22 35	23 30
26	16 41	06 23	05 37	16 07	22 42	23 30
27	16 24	06 01	06 00	16 25	22 48	23 30
28	16 07	05 37	06 23	16 43	22 54	23 30
29	15 50	05 15	06 46	17 00	23 00	23 30
30	15 33	04 52	07 09	17 17	23 05	23 30
31	15 15	04 29		17 34		23 30

A Description of the TABLES of the Sun's Declination.

THES E Tables are in General for Four Years; *Leap Year, First, Second and Third Year after Leap-Year*; but consequential for any Year.

Each Year (taking up two Pages) hath the first Six Months of the Year on the Left-hand Page. and the last Six Months are on the Right-hand Page; the Names of the Months are at the Head of each Column, and the Days of each Month in the Left-hand Column of each Page.

The First Table sheweth the Sun's Declination every Day for the First Year after Leap-Year, being 1717, 1721, 1725, 1729, 1733, &c. and takes up Page (10,) and (11) The Second Table is for 1718, 1722, 1726, 1730, 1734 &c. being Second Years after Leap-Year (in Page 12) and (13): The next Table in Page (14) and (15) is for the Third Year after Leap-Year: The Fourth Table in Page (16) and (17) sheweth the Sun's Declination for Leap Year being 1720, 1724, 1728, 1732, 1736, &c.

Under the Name of the Month, is the Name of the Declination, either North, or South: only the Column for March, and September, hath two Names; that is, under March, is South, and against the 10th Day is Nor. for North and under September is North, and against the 12th, or 13th Day is Sou. for South: intimating the Declination South, in March, till the 10th Day, and all the remaining part of that Month it's Nor. or North; in like manner September, it's North till the 12th or 13th Day, and from thence to the Months end it's Sou. or South.

The Use of the Tables of Declination.

TO find the Sun's Declination for any Day in any Year, is after this manner.

1. Seek the *Year* and *Month* at the Head of the Table; and the Day of the Month in the Left hand Column.
2. Then right under the *Month*, at the Head of the Table, and against the Day of the Month in the Left-hand Column, is the Sun's Declination required.

Example 1. I desire to know the Sun's Declination for the 24th Day of *April* 1718.

The Year 1718, is the Second Year after Leap-Year, which is in Page [12]; then under *April*, and against 24 [under Days] is 16. 12, with North at the Head of the Table under *April*; which sheweth the Sun's Declination on the 24th of *April* 1718, is 16d. 12m. North.

Example 2. What is the Sun's Declination for the 10th Day of *March* 1719?

The Year 1719, being the Third Year after Leap-Year is found in Page 14; then against the 10th Day, and under *March*, is Nor. 05; signifying the Sun's Declination at that time given, is 05m. North: the like do for any other Time:

A Table to Proportion the Sun's Declination to any other Meridian.

		<i>The daily difference in Declination.</i>											
		m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.
all Well. } Long with Decl Decr. } Inter. Subtr. out Decl. Decr. } Add	Degrees of Longitude.	2	4	6	8	10	12	14	16	18	20	22	24
		m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.
	15												
	30	0	0	0	0	0	0	1	1	1	1	1	1
	45	0	0	0	1	1	1	1	1	1	2	2	2
	60	0	0	1	1	1	1	2	2	2	2	3	3
	75	0	1	1	1	2	2	2	3	3	3	4	4
	90	0	1	1	2	2	3	3	4	4	5	5	6
	105	1	1	2	2	3	3	4	5	5	6	6	7
	120	1	1	2	3	3	4	5	5	6	7	7	8
	135	1	1	2	3	4	4	5	6	7	7	8	9
	150	1	2	2	3	4	5	6	7	7	8	9	10
	165	1	2	3	4	5	5	6	7	8	9	10	11
	180	1	2	3	4	5	6	7	8	9	10	11	12

The Use of this Table of Proportion.

THE Tables of the Sun's Declination are Calculated for the Meridian of London, and will serve any Place under that Meridian; but for those Places situate Easterly, or Westerly from it, the Declination must be proportioned according to its Daily Difference in the Table, and Longitude of those Places, from the Meridian of London; for which purpose this Table is useful, as it's evident by these Examples following.

Ex.

Example 1.

Admit the 10th Day of *April*, Anno 1720, I am in Longitude 105d. East; I demand what Declination the Sun will have that Day in the Meridian of that Place?

The Declination for *April* 10th, in the Meridian of *London* is 11d. 58m. increasing, and the Daily Difference at that Time, is 20m. therefore in this Table look in the Head thereof for the nearest Number to 20m which is 20m. then look on the Left-hand of the Table for 105 Deg the Longitude I am in, and in the Common Angle of meeting is 6m which is to be deducted from the Declination in the Meridian of *London* aforesaid, 11 d. 58 m and the Remainder will be the Declination for that Meridian, or the Longitude I am in, which is 11 d. 52m. North. But if the Declination had decreased, as it doth here increase, then you must have added, as here under you may see.

	d. m.
The Declination in the Meridian of <i>London</i> is	11 58 N.
The Proportional Minutes subtract,	— 00 06
The Declia. for the Longitude of 105d. East is	11 52 N.
The Declination for the Longit of 105d. W. is	12 04 N.

Example 2.

Admit the 10th Day of *October*, Anno 1718. I am in Longitude 87d. West, I demand the Declination that the Sun will have that Day in that Meridian?

The Daily Difference in the Table of Declination, at this Time is 21m. and the Proportional Part thereof by the last Table is 5m. increasing.

	d. m.
The Declination in the Meridian of <i>London</i>	10 38 S.
The proportional Minutes, add	— 00 05
The Declination in the Longit. of 87d. West is	10 43 S.
The Declination the Longitude of 87d. East is	10 33 S.

*A Table of the Refractions of Sun, Moon, and Stars
according to the Observation of Tycho Brahe*

<i>Altitudes</i> <i>Deg.</i>	<i>Sun's</i> <i>Refrac</i> <i>min.</i>	<i>Moons</i> <i>Refrac</i> <i>min.</i>	<i>Stars</i> <i>Refrac</i> <i>min.</i>	<i>Altitudes</i> <i>deg.</i>	<i>Sun's</i> <i>Refrac</i> <i>min.</i>	<i>Moon's</i> <i>Refrac</i> <i>min.</i>
0	34	33	30	18	06	06
1	36	25	31	19	05	06
2	20	20	15	20	04	05
3	17	17	12	21	04	05
4	15	15	11	22	03	04
5	14	14	10	23	03	04
6	13	13	09	24	03	04
7	12	13	08	25	02	03
8	11	12	07	26	02	03
9	10	11	06	27	02	03
10	10	11	05	28	02	02
11	09	10	05	29	02	02
12	09	09	04	30	01	02
13	08	09	04	31	01	02
14	08	08	03	32	01	01
15	07	08	03	33	01	01
16	07	07	02	34	01	01
17	06	07	02	35	01	01

The Refraction of the *Sun, Moon and Stars*, causes them to appear higher above the *Horizon* than they are therefore the Refraction is always to be subtracted from the *Altitude Observed*, that the *True Altitude* may be had.

As admit the *Sun's Meridian Altitude*, by Observation to be 5 Degrees, I demand the *True Altitude*?

	d.	m.
Altitude by Observation being	05	00
Sun's Refraction, subtract	00	14

The *Sun's True Meridian Altitude* is 04 46

primus

Primum Mobile :

O R,

*Astronomical Tables;
Each Table being a SUN-DIAL:*

S H E W I N G

The exact Hour of the Day, the Sun
 being upon any Point of the Com-
 pass, fitting all Places upon the Earth
 and Sea, that lie between the *Equi-
 noctial* and 60 Degrees of Latitude,
 either *North*, or *South*: And to
 last with Exactness as long as the
 Great and Everlasting Creator shall
 be pleased to hold together the
 Great and Wonderful Fabrick of
 Nature.

The Mariners Compass Rectified

A Sun-Dial for the Latitude of 0 Degrees.

North Declination.

Degs.	0	d 1	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point	h	m	h	m	h	m	h	m	h	m	h
Nort.	12	12	12	12	12	12	12	12	12	12	12
n by w	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0.19	0.21	0.23
n n w	0.04	0.08	0.12	0.17	0.21	0.25	0.30	0.35	0.39	0.44	0.48
n w by n	0.07	0.13	0.20	0.27	0.34	0.41	0.49	0.56	1.03	1.08	1.13
n w	0.10	0.20	0.30	0.41	0.51	1.02	1.14	1.25	1.36	1.47	1.58
n w by w	0.15	0.30	0.45	1.01	1.18	1.35	1.53	2.12	2.32	2.51	3.10
w n w	0.24	0.49	1.14	1.41	2.09	2.41	3.18	4.06	5.07	6.10	7.15
w by n	0.51	1.44	2.46	4.10							
West.											
© fet.	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	2.30	5.00	7.30	10.0	12.30	15.0	17.30	20.0	22.30	23.30

South Declination.

[illegible]

*A Sun-Dial for the Latitude of 2 Degrees.***North Declination.**

d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
m	30m	30m	30m	30m	30m	30m	30m	30m	30m	30m
h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m
12	Nort.	12	12	12	12	12	12	12	12	12
0.02	n by w	0.02	0.04	0.07	0.09	0.11	0.13	0.15	0.17	0.18
0.03	n n w	0.05	0.09	0.13	0.18	0.22	0.27	0.32	0.36	0.38
0.06	n w by n	0.08	0.15	0.22	0.29	0.36	0.43	0.51	0.57	1.01
0.08	n w	0.12	0.22	0.33	0.43	0.54	1.05	1.17	1.27	1.35
0.12	n w by w	0.18	0.37	0.49	1.05	1.22	1.40	2.00	2.16	2.30
0.16	w n w	0.29	0.55	1.21	1.50	2.21	2.58	3.45	4.46	
0.40	w by n	1.03	2.03	3.23						
6.0	West									
5.00	@ fet	5.00	5.00	6.01	6.01	6.02	6.02	6.02	6.03	6.04
d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
2.00	Amp.	2.3	5.00	7.30	10.0	12.30	15.0	17.31	20.1	22.1
										23.31

South Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
in.	30m	30m	30m	30m	30m	30m	30m	30m	30m	30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12
s by w	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
s s w	0.03	0.07	0.12	0.16	0.20	0.25	0.29	0.34	0.38	0.42
s w by s	0.05	0.12	0.19	0.25	0.32	0.39	0.46	0.54	1.01	1.08
s w	0.08	0.18	0.27	0.38	0.49	0.59	1.10	1.21	1.32	1.43
w w by w	0.12	0.27	0.42	0.57	1.13	1.29	1.46	2.04	2.23	2.40
w s w	0.15	0.43	1.08	1.33	2.0	2.28	3.00	3.36	4.14	5.24
w by s	0.43	1.30	2.24	3.22	4.43					
West	6.00									
@ fet	6.00	6.00	5.00	4.05	3.50	3.48	3.58	3.58	3.57	3.57

The Mariners Compass Rectified.

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A Sun-Dial for the Latitude of 3 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
12 North	12	12	12	12	12	12	12	12	12	12
0.02 n by w	Zen. W. cit.	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18
0.05 n n w		0.03	0.07	0.12	0.16	0.21	0.25	0.30	0.34	0.37
0.08 nw by n		0.05	0.12	0.19	0.26	0.33	0.40	0.46	0.54	0.59
0.12 n w		0.08	0.19	0.29	0.35	0.50	1.01	1.13	1.23	1.31
0.18 nw by w		0.12	0.27	0.43	0.59	1.16	1.34	1.54	2.10	2.24
0.29 w n w		0.20	0.45	1.11	1.39	2.11	2.47	3.33	4.31	
0.59 w by n		0.42	1.40	2.57						
6.00										
6.00 © fet.	6.00	6.01	6.01	6.02	6.02	6.03	6.04	6.04	6.05	6.05
d.m. Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
0.00 Amp.	2.30	5.00	7.30	10.1	12.31	15.1	17.31	20.2	22.2	23.32

South Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point.	h.m.	h.m.	h.m.	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12
s by w	0.02	0.04	0.06	0.08	0.10	0.13	0.15	0.17	0.19	0.22
s s w	0.05	0.09	0.13	0.18	0.22	0.26	0.31	0.35	0.40	0.47
sw by s	0.08	0.15	0.21	0.28	0.35	0.42	0.49	0.56	1.04	1.15
s w	0.12	0.22	0.3	0.42	0.53	1.03	1.14	1.25	1.37	1.55
sw by w	0.18	0.33	0.48	1.03	1.19	1.35	1.52	2.11	2.30	2.46
w s w	0.29	0.53	1.17	1.42	2.09	2.37	3.08	3.43	4.31	5.22
w by s	0.59	1.48	2.47	3.38	4.55					
West	6.00									
© fet	5.00	6.00	5.59	5.59	5.58	5.58	5.57	5.56	5.55	5.55

A Sun-Dial for the Latitude of 4 Degrees.

North Declination.

Deg.	0 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.				30m		30m		30m		30m
Point.	h m	Point	h m	h m	h m	h m	h m	h m	h m	h m
South	12	Nort	12	12	12	12	12	12	12	12
s by w	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0.11	0.13	0.15
s s w	0.02	n n w	0.02	0.06	0.10	0.14	0.19	0.23	0.28	0.32
sw by s	0.04	nwb n	0.03	0.09	0.16	0.23	0.30	0.38	0.45	0.52
s w	0.06	n w	0.04	0.14	0.21	0.35	0.46	0.57	1.09	1.19
swbw	0.09	nwbw	0.05	0.21	0.37	0.53	1.10	1.28	1.47	2.04
w s w	0.14	n n w	0.10	0.35	1.01	1.29	2.00	2.36	3.21	4.17
w by s	0.29	whyn	0.21	1.17	2.29					
West.	3.24									
☉ set	5.00	☉ set	5.01	6.02	6.03	6.03	6.04	6.05	6.06	6.06
Sun's	d.m	Sun's	d.m	d.m	d.m	d.m	d.m	d.m	d.m	d.m
Amp.	2.30	Amp	5.00	7.31	10.11	12.31	15.2	17.32	20.3	22.3

South Declination.

Deg.	0 d	4 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.											
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.03	0.05	0.07	0.09	0.11	0.13	0.17	0.18	0.20	0.22	0.23
s s w	0.07	0.11	0.15	0.19	0.23	0.28	0.32	0.36	0.41	0.45	0.48
sw by s	0.11	0.17	0.21	0.31	0.38	0.45	0.52	0.59	1.07	1.13	1.18
s w	0.15	0.26	0.35	0.45	0.57	1.07	1.18	1.29	1.41	1.51	1.59
swbw	0.24	0.39	0.54	1.09	1.25	1.4	1.58	2.16	2.35	2.52	3.04
w s w	0.38	1.02	1.26	1.51	2.17	2.45	3.17	3.52	4.38	5.33	
w by s	1.17	2.05	2.55	3.51	5.03						
West.	5.00										
☉ set	5.00	5.00	5.59	5.58	5.57	5.57	5.5	5.55	5.54	5.5	5.4

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A Sun-Dial for the Latitude of 5 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point.	h m	Point.	h m	h m	h m	h m	h m	h m	h m	h m
South 12	North 12	Zen. West.	12	12	12	12	12	12	12	12
by w 0.02	n by w 0.02		0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16
s w 0.04	n n w 0.04		0.04	0.08	0.13	0.17	0.22	0.26	0.30	0.33
w by s 0.07	n w by n 0.07		0.07	0.14	0.21	0.28	0.35	0.43	0.49	0.54
s w 0.10	n w 0.10		0.10	0.20	0.31	0.42	0.53	1.05	1.15	1.22
w by w 0.15	n w by w 0.15		0.15	0.31	0.47	1.04	1.21	1.40	1.57	2.10
s w 0.20	w n w 0.20		0.20	0.51	1.18	1.49	2.24	3.08	4.00	
w by s 0.48	w by n 0.48		0.54	2.01						
West. 4.00	West. 4.00									
set 6.00	set 6.00		6.02	6.03	6.04	6.04	6.05	6.06	6.07	6.09
sun's d.m.	sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
amp. 2.30	Amp. 5.01		7.31	10.2	12.38	15.3	17.34	20.5	22.5	23.26

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South 12	12	12	12	12	12	12	12	12	12	12	12
by w 0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	
s w 0.08	0.12	0.17	0.21	0.25	0.29	0.34	0.38	0.43	0.47	0.50	
w by s 0.13	0.20	0.27	0.33	0.40	0.47	0.54	1.02	1.09	1.16	1.21	
s w 0.20	0.30	0.40	0.50	1.00	1.11	1.22	1.33	1.45	1.55	2.02	
w by w 0.30	0.45	1.00	1.15	1.34	1.46	2.03	2.21	2.40	2.56	3.11	
s w 0.48	1.11	1.31	2.00	2.26	2.53	3.24	3.55	4.43	5.35		
w by s 1.35	2.21	3.09	4.03	5.11							
West. 6.00											
set 6.00	5.49	5.55	5.47	5.56	5.56	5.55	5.54	5.53	5.52	5.41	

A Sun Dial for the Latitude of 6 Degrees.

North Declination

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23	Deg.
Min.	30m		30m		30m		30m		30m		Min.
Point	h	m	h	m	h	m	h	m	h	m	Point
South	12	12	N. ri.	12	12	12	12	12	12	12	South
s by w	0.05	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0.11	0.13	s by w
s s w	0.06	0.02	n n w	0.03	0.07	0.11	0.15	0.20	0.24	0.28	s s w
sw by s	0.08	0.03	n w by n	0.04	0.11	0.18	0.25	0.32	0.40	0.46	sw by s
s w	0.14	0.04	n w	0.06	0.16	0.27	0.38	0.49	1.01	1.10	s w
sw b w	0.21	0.06	n w by w	0.09	0.25	0.41	0.57	1.15	1.34	1.50	sw b w
w s w	0.31	0.10	w n w	0.15	0.40	1.08	1.38	2.15	2.59	3.44	w s w
w by	0.06	0.20	w b n	0.32	1.34	3.24					w by
West.	1.2	2.15									West.
☉ set	6.01	5.02	☉ set	6.03	6.04	6.05	6.06	6.07	6.09	6.10	☉ set
Sun's	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's
Amp	2.30	5.01	Amp	7.32	10.3	12.34	15.5	17.36	20.6	22.7	Amp

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23	Deg.
Min.			30m		30m		30m		30m		30m	Min.
Point	h	m	h	m	h	m	h	m	h	m	h	Point
South	12	12	12	12	12	12	12	12	12	12	12	out
s by w	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.22	0.23	by
s w	0.10	0.14	0.18	0.22	0.27	0.31	0.35	0.40	0.44	0.48	0.52	ss
sw by s	0.16	0.23	0.29	0.36	0.43	0.50	0.57	1.04	1.12	1.18	1.25	sw b
s w	0.24	0.34	0.44	0.50	1.04	1.15	1.25	1.37	1.48	1.58	2.08	s v
sw b w	0.36	0.50	1.05	1.20	1.36	1.52	2.08	2.26	2.45	3.02	3.18	sw b
w s w	0.57	1.20	1.44	2.08	2.34	3.01	3.31	4.06	4.48	5.37		w s
w by	1.51	2.35	3.22	4.13	5.16							w by
West	6.00											West
☉ set	6.00	5.59	5.58	5.57	5.56	5.55	5.54	5.53	5.51	5.50	5.49	☉ set

The Mariners Compass Rectified.

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A Sun Dial for the Latitude of 7 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point.	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m
South	12	12	Nort.	12	12	12	12	12	12	12
by w	0.04	0.02	n b w	0.00	0.02	0.04	0.07	0.09	0.11	0.13
ss w	0.07	0.03	n n w	0.01	0.05	0.09	0.14	0.18	0.23	0.27
w by s	0.12	0.05	nwb n	0.01	0.08	0.15	0.22	0.29	0.36	0.44
s w	0.18	0.08	n w	0.02	0.12	0.22	0.33	0.45	0.56	1.06
wb w	0.27	0.12	nwb w	0.03	0.18	0.34	0.51	1.08	1.27	1.43
w s w	0.43	0.19	w n w	0.05	0.30	0.57	1.27	2.00	2.42	3.28
w by s	1.23	0.39	w b n	0.10	1.08	2.36				
West.	4.37	2.58								
set	6.02	6.02	set	6.03	6.05	6.06	6.08	6.09	6.10	6.12
Sun's	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.31	5.02	Amp.	7.33	10.4	12.35	5.7	17.38	20.9	32.10

South Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12
by w	0.06	0.07	0.09	0.11	0.13	0.16	0.18	0.20	0.22	0.24
s w	0.12	0.16	0.20	0.24	0.28	0.33	0.37	0.41	0.46	0.50
w by s	0.19	0.25	0.32	0.39	0.45	0.52	0.59	1.07	1.13	1.21
s w	0.28	0.38	0.48	0.58	1.08	1.18	1.29	1.40	1.52	2.02
wb w	0.41	0.56	1.11	1.26	1.41	1.57	2.14	2.31	2.50	3.09
w s w	1.06	1.29	1.52	2.16	2.41	3.08	3.38	4.12	4.53	5.35
w b s	2.06	2.49	3.33	4.22	5.20					
West.	6.00									
set.	6.00	5.59	5.58	5.57	5.55	5.54	5.52	5.51	5.50	5.49

*A Sun-Dial for the Latitude of 8 Degrees.***North Declination.**

Deg.	2 d	5 d	7 d		10 d	12 d	15 d	17 d	20 d	22 d	23 d	
Min.	30m		30m			30m		30m			30m	
Points	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m	
South	12	12	12	Nort.	12	12	12	12	12	12	12	
s by w	0.04	0.02	0.00	s by w	0.02	0.04	0.06	0.08	0.10	0.12	0.13	
s s w	0.09	0.05	0.01	n n w	0.03	0.08	0.12	0.17	0.21	0.25	0.28	
sw by s	0.15	0.08	0.01	n w b n	0.05	0.12	0.20	0.27	0.34	0.41	0.45	
s w	0.22	0.12	0.02	n w	0.08	0.18	0.29	0.40	0.52	0.62	0.69	
sw b w	0.33	0.18	0.03	n w b w	0.12	0.28	0.43	0.60	0.79	1.05	1.47	
w s w	0.52	0.29	0.05	w n w	0.20	0.46	0.76	1.16	1.48	2.28	3.11	
w by s	1.39	0.56	0.10	w by n	0.44	1.39						
West.	4.48	3.36	1.22									
☉ set.	6.01	6.03	6.04	☉ set.	6.06	6.07	6.09	6.10	6.12	6.13	6.14	
Sun's	d m	d m	d m	Sun's	d m	d m	d m	d m	d m	d m	d m	
Amp.	2.31	5.02	7.34	Amp.	10.6	15.9	15.5	17.40	20.12	22.13	23.46	

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d	
Min.		30m		30m		30m		30m			30m	
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.21	0.23	0.25	0.26	
s s w	0.13	0.17	0.21	0.26	0.30	0.34	0.38	0.43	0.47	0.51	0.54	
sw by s	0.21	0.28	0.34	0.41	0.48	0.55	1.02	1.09	1.17	1.23	1.28	
s w	0.30	0.41	0.55	1.01	1.11	1.22	1.33	1.44	1.55	2.05	2.13	
sw b w	0.47	1.02	1.16	1.31	1.46	2.02	2.17	2.35	2.53	3.09	3.22	
w s w	1.14	1.37	2.00	2.24	2.48	3.15	3.44	4.17	4.56	5.39		
w by s	2.20	3.0	3.44	4.26	5.24							
West.	5.0											
☉ set.	6.00	5.55	5.57	5.56	5.54	5.53	5.51	5.50	5.48	5.47	5.46	

A Sun-Dial for the Latitude of 9 Degrees.

North Declination.

Deg.	0 d	5 d	7 d		10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m				30m
Points	h	m	h	m	Point	h	m	h	m	h	m
South	12	12	12		North	12	12	12	12	12	12
by w	0.05	0.03	0.01		n by w	0.01	0.03	0.05	0.07	0.09	0.11
s w	0.11	0.07	0.03		n n w	0.02	0.06	0.10	0.14	0.19	0.23
sw by s	0.17	0.11	0.04		nwb n	0.03	0.10	0.17	0.24	0.31	0.38
s w	0.26	0.16	0.06		n w	0.04	0.14	0.25	0.36	0.47	0.57
wb w	0.38	0.24	0.09		nwbw	0.06	0.22	0.38	0.55	1.14	1.30
w s w	1.00	0.38	0.14		w n w	0.10	0.36	1.04	1.36	2.15	2.55
w by s	1.53	1.13	0.29		w by n	0.21	1.27				
West.	4.56	3.46	2.15								
☉ set	6.01	5.03	6.04		☉ set	6.06	6.08	6.10	6.12	6.14	6.16
Sen's d	m	d	m	d	Sun's d	m	d	m	d	m	d
Amp.	2.31	5.03	7.35		Amp.	10.7	12.39	15.11	17.43	20.16	22.18

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12		12	12	12	12	12	12	12
by w	0.07	0.09	0.11		0.13	0.15	0.17	0.19	0.21	0.24	0.27
s s w	0.15	0.19	0.23		0.27	0.31	0.36	0.40	0.44	0.49	0.54
w by s	0.24	0.30	0.37		0.44	0.50	0.57	1.04	1.12	1.19	1.25
s w	0.36	0.45	0.55		1.05	1.15	1.26	1.36	1.47	1.59	2.09
wb w	0.53	1.07	1.22		1.36	1.52	2.07	2.24	2.41	2.59	3.15
w s w	1.23	1.45	2.08		2.31	2.55	3.21	3.50	4.22	5.00	5.40
w by s	2.33	3.12	3.53		4.36	5.27					
West.	6.00										
☉ set	6.00	5.50	5.57		5.56	5.54	5.52	5.50	5.48	5.46	5.44

A Sun Dial for the Latitude of 10 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d		12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m			30m		30m			30m
Points	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m
South	12	12	12	12	North	12	12	12	12	12	12
s by w	0.06	0.04	0.02		n by w	0.02	0.04	0.06	0.08	0.10	0.12
s s w	0.12	0.08	0.04		n n w	0.04	0.09	0.13	0.18	0.21	0.24
sw by s	0.20	0.13	0.07		nw by n	0.07	0.14	0.21	0.29	0.35	0.40
s w	0.30	0.17	0.10		n w	0.10	0.21	0.32	0.43	0.53	1.00
s w w	0.44	0.31	0.19		nwb w	0.15	0.32	0.49	1.06	1.23	1.35
w s w	1.09	0.47	0.24		w n w	0.25	0.53	1.24	2.01	2.39	3.19
w by s	2.07	1.28	0.47		w by n	0.59	1.07				
West	5.03	4.01	2.47								
☉ set	6.02	6.04	6.05	6.07	☉ set	6.09	6.11	6.13	6.15	6.17	6.18
Sun's	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp	2.32	5.05	7.37	10.10	Amp.	12.42	15.15	17.47	20.20	22.22	23.50

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.27
s s w	0.16	0.21	0.25	0.29	0.33	0.37	0.42	0.46	0.51	0.54	0.57
sw by s	0.26	0.33	0.40	0.46	0.53	1.00	1.07	1.14	1.22	1.28	1.33
s w	0.39	0.49	0.56	1.09	1.19	1.29	1.40	1.51	2.02	2.12	2.19
sw w	0.58	1.13	1.27	1.42	1.57	2.12	2.28	2.45	3.03	3.19	3.32
w s w	1.31	1.53	2.15	2.38	3.02	3.27	3.55	4.26	5.03	5.41	
w by s	2.44	3.22	4.01	4.42	5.29						
West	6.00										
☉ set	6.07	5.58	5.56	5.55	5.53	5.51	5.49	5.47	5.45	5.43	5.43

A Sun-Dial for the Latitude of 11 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d		12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m			30m		30m			30m
Point.	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m
South	12	12	12	12	Nort.	12	12	12	12	12	12
s by w	0.07	0.05	0.03	0.01	n b w	0.01	0.03	0.05	0.07	0.09	0.11
ss w	0.14	0.10	0.06	0.02	n n w	0.02	0.07	0.11	0.16	0.20	0.22
sw by s	0.21	0.16	0.11	0.03	nwb n	0.04	0.11	0.18	0.26	0.34	0.37
s w	0.34	0.24	0.14	0.04	n w	0.06	0.17	0.28	0.39	0.52	0.56
sw by w	0.50	0.35	0.21	0.06	nwb w	0.09	0.25	0.42	1.00	1.15	1.28
w s w	1.17	0.56	0.33	0.08	w n w	0.15	0.41	1.12	1.47	2.23	2.59
w by s	2.19	1.43	1.03	0.20	w b n	0.33	1.55				
West.	5.08	4.13	3.09	2.19							
☉ set	6.02	6.04	6.06	6.08	☉ set	6.10	6.12	6.14	6.16	6.18	6.19
Sun's d.m.	d.m.	d.m.	d.m.	d.m.	Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp	2.32	5.05	7.38	10.11	Amp	12.44	15.17	17.50	20.24	22.37	23.59

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.28
ss w	0.18	0.22	0.26	0.30	0.34	0.39	0.43	0.47	0.52	0.56	0.59
sw by s	0.29	0.37	0.42	0.49	0.55	1.02	1.09	1.16	1.24	1.30	1.35
s w	0.43	0.53	1.03	1.12	1.22	1.33	1.43	1.54	2.05	2.15	2.22
sw by w	1.04	1.18	1.32	1.47	2.01	2.17	2.33	2.49	3.07	3.23	3.35
w s w	1.39	2.01	2.22	2.45	3.10	3.33	4.00	4.30	5.05	5.41	
w b s	2.55	3.31	4.08	4.47	5.31						
West.	6.00										
☉ set.	6.00	5.58	5.56	5.54	5.52	5.50	5.48	5.46	5.44	5.42	5.47

A Sun-Dial for the Latitude of 12 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d		12 d	15 d	17 d	20 d	22 d	23 d	Deg.
Min.	30m		30m			30m		30m			30m	Min.
Point.	h m	h m	h m	h m	Point.	h m	h m	h m	h m	h m	h m	Point.
South	12	12	12	12	Nort	12	12	12	12	12	12	South
s by w	0.07	0.06	0.04	0.02	n by w	0.00	0.02	0.04	0.07	0.09	0.10	s by w
s s w	0.16	0.12	0.08	0.04	n n w	0.01	0.05	0.10	0.14	0.18	0.21	s s w
sw by s	0.25	0.19	0.12	0.05	n w b n	0.01	0.08	0.15	0.23	0.29	0.34	sw by s
s w	0.37	0.28	0.18	0.08	n w	0.02	0.12	0.23	0.35	0.44	0.51	s w
sw b w	0.55	0.41	0.27	0.12	n w b w	0.03	0.19	0.33	0.49	1.09	1.21	sw b w
w s w	1.25	1.04	0.42	0.19	w n w	0.05	0.31	1.00	1.14	2.07	2.40	w s w
w by s	2.31	1.56	1.23	0.38	w b n	0.09	1.17					w by s
West.	5.13	4.23	3.27	2.16								West.
☉ set.	6.02	6.04	6.06	6.09	☉ set.	6.11	6.13	6.15	6.18	6.20	6.22	☉ set.
Sun's	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's
Amp.	2.33	5.07	7.39	10.13	Amp.	12.46	15.20	17.55	20.28	22.31	24.9	Amp.

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d	Deg.
Min.		30m		30m		30m		30m			30m	Min.
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	Point.
South	12	12	12	12	12	12	12	12	12	12	12	South
s by w	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	s by w
s s w	0.20	0.24	0.28	0.32	0.36	0.40	0.44	0.49	0.53	0.57	1.00	s s w
sw by s	0.32	0.38	0.45	0.51	0.58	1.05	1.12	1.19	1.26	1.32	1.37	sw by s
s w	0.47	0.56	0.66	1.16	1.26	1.36	1.46	1.57	2.08	2.18	2.28	s w
sw b w	1.09	1.23	1.37	1.52	2.06	2.22	2.37	2.51	3.11	3.27	3.38	sw b w
w s w	1.47	2.07	2.29	2.51	3.14	3.38	4.04	4.33	5.07	5.41		w s w
w by s	3.05	3.39	4.18	4.51	5.32							w by s
West.	6.00											West.
☉ set.	6.00	5.58	5.56	5.54	5.51	5.49	5.47	5.45	4.42	5.40	5.38	☉ set.

A Sun-Dial for the Latitude of 13 Degrees.

North Declination.

Deg	2 d	5 d	7 d	10 d	12 d		15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m		30m		30m
Point.	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
12 South	12	12	12	12	12	North	12	12	12	12	12
0.10 by w	0.08	0.06	0.04	0.02	0.00	n b w	0.02	0.04	0.06	0.08	0.09
0.21 s w	0.17	0.13	0.09	0.05	0.01	n n w	0.03	0.08	0.12	0.16	0.15
0.34 w by s	0.28	0.21	0.15	0.08	0.01	n b n	0.06	0.13	0.21	0.27	0.31
0.51 s w	0.41	0.32	0.22	0.12	0.02	n w	0.08	0.17	0.30	0.40	0.47
1.21 w by w	1.01	0.47	0.32	0.18	0.03	n w w	0.13	0.29	0.46	1.01	1.13
2.40 w s w	1.33	1.12	0.51	0.28	0.05	w n w	0.21	0.49	1.21	1.52	2.22
w by s	2.41	2.08	1.29	0.54	0.10	w b n	0.48				
West.	5.16	4.31	3.39	2.41	1.05						
6.21 ☉ set	6.02	6.05	6.07	6.09	6.11	☉ set	6.14	6.16	6.19	6.21	6.23
d.m. Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m. Sun's	d.m.	d.m.	d.m.	d.m.	d.m.
24.9 Amp	2.33	5.08	7.42	10.16	12.49	Amp	15.24	17.39	20.33	22.37	24.11

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
12 South	12	12	12	12	12	12	12	12	12	12	12
0.21 by w	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.29
1.00 s w	0.21	0.25	0.29	0.33	0.38	0.42	0.46	0.50	0.55	0.59	1.02
1.37 w by s	0.34	0.41	0.47	0.54	1.00	1.07	1.14	1.20	1.28	1.34	1.39
2.29 s w	0.51	1.00	1.10	1.19	1.29	1.39	1.50	2.01	2.12	2.21	2.29
3.39 w by w	1.14	1.28	1.43	1.56	2.11	2.26	2.41	2.58	3.15	3.30	3.42
s w	1.54	2.15	2.36	2.57	3.20	3.43	4.09	4.37	5.09	5.40	
b s	3.14	3.47	4.20	4.55	5.34						
West.	6.00										
5.38 ☉ set	6.00	5.58	5.55	5.53	5.51	5.45	5.46	5.44	5.41	5.39	5.37

A Sun-Dial for the Latitude of 14 Degrees.

North Declination.

Deg.	2	5	7	10	12	15	17	20	22	23
Min.	30m		30m		30m		30m			30
Points	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m
South	12	12	12	12	12	Nort.	12	12	12	12
s by w	0.09	0.07	0.05	0.03	0.01	n by w	0.01	0.03	0.05	0.07
s s w	0.19	0.15	0.11	0.07	0.03	n n w	0.02	0.06	0.15	0.14
sw by s	0.36	0.24	0.17	0.11	0.04	nwb n	0.03	0.16	0.17	0.22
s w	0.45	0.35	0.26	0.16	0.06	n w	0.04	0.15	0.26	0.35
swb w	1.06	0.55	0.38	0.24	0.09	nwbw	0.06	0.22	0.40	0.54
w s w	1.41	1.20	0.59	0.38	0.15	w n w	0.10	0.37	1.08	1.38
w by s	2.52	2.19	1.46	1.10	0.29	w by n	0.22	1.48		
West.	5.20	4.37	3.52	3.00	1.49					
☉ set	6.02	6.05	6.07	6.10	6.12	☉ set	6.15	6.18	6.21	6.23
Sun's d	m d	m d	m d	m d	m d	Sun's d	m d	m d	m d	m d
Amp.	2.34	5.09	7.44	10.19	12.53	Amp.	15.28	18.3	20.38	22.43

South Declination.

Deg.	0	2	5	7	10	12	15	17	20	22	23
Min.		30m		30m		30m		30m			30
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31
s s w	0.23	0.27	0.31	0.35	0.40	0.44	0.48	0.53	0.57	1.01	1.04
sw by s	0.37	0.43	0.50	0.56	1.03	1.10	1.16	1.23	1.31	1.36	1.41
s w	0.54	1.04	1.13	1.23	1.33	1.43	1.53	2.04	2.15	2.24	2.33
swb w	1.20	1.33	1.47	2.01	2.15	2.30	2.45	3.02	3.19	3.33	3.46
w s w	2.01	2.21	2.42	3.03	3.25	3.48	4.12	4.40	5.11	5.40	
w by s	3.22	3.53	4.25	4.59	5.35						
West.	6.00										
☉ set	6.00	5.58	5.55	5.53	5.50	5.48	5.45	5.42	5.39	5.37	5.35

A Sun-Dial for the Latitude of 15 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m
South	12	12	12	12	12	Nort.	12	12	12	12
s by w	0.10	0.08	0.06	0.04	0.02	n by w	0.02	0.04	0.06	0.07
ss w	0.21	0.16	0.12	0.08	0.04	n n w	0.04	0.09	0.12	0.15
sw by s	0.33	0.26	0.20	0.13	0.07	nw b n	0.07	0.14	0.20	0.25
s w	0.49	0.39	0.30	0.20	0.10	n w	0.11	0.22	0.31	0.38
sw by w	1.11	0.58	0.44	0.30	0.15	nw b w	0.16	0.33	0.47	0.59
w s w	1.40	1.28	1.08	0.47	0.24	w n w	0.26	0.56	1.24	1.50
w by s	3.00	2.30	1.58	1.24	0.46	w by n	1.06			
West.	5.22	4.44	4.02	3.15	2.17					
☉ set.	6.02	6.05	6.08	6.11	6.13	☉ set.	6.16	6.19	6.22	6.27
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.
Amp.	2.35	5.10	7.46	10.21	12.56	Amp.	15.32	18.8	20.44	22.19
									24.24	

Zen. West.

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.			30m		30m	30m		30m			30m
Point	h.m.	h.m.	h.m.	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.31
ss w	0.24	0.28	0.3	0.36	0.40	0.45	0.49	0.53	0.58	1.01	1.04
sw by s	0.39	0.46	0.52	0.59	1.05	1.12	1.18	1.25	1.33	1.39	1.43
s w	0.58	1.07	1.17	1.26	1.36	1.46	1.56	2.07	2.18	2.27	2.34
sw by w	1.25	1.38	1.5	2.06	2.20	2.34	2.49	3.05	3.22	3.37	3.48
w s w	2.08	2.28	2.48	3.08	3.29	3.52	4.16	4.42	5.12	5.40	
w by s	3.30	4.00	4.30	5.02	5.36						
West.	6.00										
☉ set.	6.00	5.58	5.55	5.52	5.49	5.47	5.44	5.41	5.38	5.35	5.33

C

A Sun Dial for the Latitude of 16 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d		17 d	20 d	22 d	23 d
Min.	30m		30m		30m			30m			30m
Points	h m h	m h m	m h m	m h m	m h m	m h m	Point	h m h	m h m	m h m	m h m
South	12	12	12	12	12	12	Nort.	12	12	12	12
s by w	0.11	0.09	0.07	0.05	0.03	0.01	n by w	0.01	0.03	0.05	0.07
s s w	0.22	0.18	0.14	0.10	0.06	0.02	n n w	0.03	0.07	0.11	0.14
sw by s	0.35	0.29	0.23	0.16	0.10	0.03	nw by n	0.04	0.05	0.17	0.21
s w	0.52	0.43	0.34	0.25	0.14	0.04	n w	0.06	0.17	0.26	0.33
s w by w	1.16	1.03	0.49	0.35	0.21	0.06	n w by w	0.10	0.26	0.40	0.52
w s w	1.55	1.36	1.16	0.55	0.33	0.10	w n w	0.16	0.44	1.11	1.34
w by s	3.08	2.39	2.09	1.37	1.01	0.20	w by n	0.36			
West.	5.25	4.49	4.11	3.28	2.37	1.23					
☉ set	6.05	6.06	6.09	6.12	6.15	6.18	☉ set	6.21	6.24	6.27	6.29
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.
Amp	2.35	5.12	7.48	10.24	13.0	15.37	Amp	18.13	20.51	22.56	24.32

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m h	m h m	m h m	m h m	m h m	m h m	h m h	m h m	m h m	m h m	m h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.13	0.14	0.16	0.18	0.20	0.22	0.24	0.25	0.28	0.30	0.32
s s w	0.26	0.30	0.34	0.38	0.42	0.46	0.50	0.55	0.59	1.03	1.06
sw by s	0.42	0.48	0.54	1.01	1.07	1.14	1.21	1.28	1.35	1.41	1.46
s w	1.02	1.11	1.20	1.29	1.39	1.49	1.59	2.10	2.21	2.30	2.37
sw by w	1.30	1.43	1.56	2.10	2.24	2.38	2.53	3.09	3.25	3.40	3.51
w s w	2.15	2.34	2.54	3.14	3.34	3.56	4.19	4.45	5.13	5.40	
w by s	3.37	4.05	4.34	5.04	5.36						
West.	6.00										
☉ set	6.0	5.57	5.54	5.51	5.48	5.45	5.42	5.39	5.36	5.33	5.31

A Sun-Dial for the Latitude of 17 Degrees.

North Declination.

deg.	2 d	5 d	7 d	10 d	12 d	15 d		17 d	20 d	22 d	23 d
in.	30m		30m		30m			30m			30m
Point.	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m
South	12	12	12	12	12	12	North	12	12	12	12
by w	0.11	0.09	0.07	0.06	0.04	0.02	n by w	0.00	0.07	0.04	0.06
s w	0.24	0.20	0.16	0.12	0.08	0.03	n n w	0.01	0.05	0.05	0.12
by s	0.38	0.32	0.25	0.19	0.13	0.05	n w b n	0.01	0.08	0.15	0.19
w	0.56	0.47	0.38	0.28	0.19	0.08	n w	0.02	0.13	0.22	0.29
by w	1.21	1.08	0.95	0.81	0.67	0.52	n w b w	0.03	0.19	0.33	0.45
s w	2.02	1.43	1.23	1.03	0.82	0.69	w n w	0.05	0.33	0.58	1.20
by s	3.16	2.48	2.20	1.49	1.16	0.87	w by n	0.11	1.36		
West.	5.27	4.53	4.18	3.39	2.54	1.55					
					5 50	5.11					
sec.	6.03	6.06	6.09	6.12	6.16	6.19	☉	sec 6.22	6.25	6.28	6.31
an's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.	d.m.
mp.	2.36	5.13	7.50	10.28	1.37	15.42	Amp.	18.19	20.57	23.4	24.40

South Declination.

deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
in.		30m		30m		30m		30m			30m
Point.	h.m.	h.m.	h.m.	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33
s w	0.28	0.32	0.36	0.39	0.43	0.47	0.52	0.56	1.01	1.04	1.07
by s	0.44	0.50	0.57	1.03	1.09	1.16	1.23	1.30	1.37	1.43	1.47
w	1.05	1.14	1.24	1.33	1.42	1.51	2.06	2.13	2.23	2.32	2.39
by w	1.35	1.48	2.01	2.14	2.28	2.42	2.57	3.12	3.29	3.42	3.54
s w	2.21	2.40	2.59	3.18	3.39	4.00	4.22	4.47	5.14	5.39	
by s	3.43	4.10	4.38	5.07	5.37						
West	6.00										
sec.	5.00	5.57	5.54	5.51	5.48	5.45	5.41	5.38	5.35	5.32	5.29

A Sun-Dial for the Latitude of 18 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d		20 d	22 d	23
Min.	30m		30m		30m		30m				30m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	12	12	North	12	12	12
s by w	0.12	0.10	0.08	0.06	0.04	0.02	0.00	n by w	0.02	0.03	0.00
s s w	0.25	0.21	0.17	0.13	0.09	0.05	0.01	n w	0.04	0.07	0.10
sw by s	0.40	0.34	0.28	0.21	0.15	0.09	0.01	n w b n	0.06	0.12	0.10
s w	1.00	0.50	0.41	0.32	0.22	0.12	0.02	n w	0.09	0.17	0.20
sw b w	1.26	1.13	1.00	0.47	0.34	0.18	0.03	n w b w	0.13	0.27	0.30
w s w	2.08	1.50	1.31	1.11	0.51	0.29	0.05	n w	0.21	0.45	1.00
w by s	3.23	2.57	2.29	2.00	1.29	0.53	0.10	w b n	0.53		
West.	5.29	4.57	4.24	3.49	3.08	2.18	0.56				
w b y n					5.51	5.15	4.32				
☉ set.	6.02	6.06	6.09	6.13	6.16	6.20	6.23	☉ set.	6.27	6.30	6.30
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.
Amp.	2.37	5.15	7.53	10.31	13.9	15.47	18.26	Amp.	21.4	23.12	24.0

South Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d		20 d	22 d	23
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	12	12	North	12	12	12
s by w	0.14	0.16	0.18	0.20	0.22	0.24	0.26	n by w	0.28	0.30	0.30
s s w	0.29	0.33	0.37	0.41	0.45	0.49	0.53	n w	0.58	1.02	1.06
sw by s	0.47	0.53	0.59	1.05	1.12	1.18	1.25	n w b n	1.32	1.39	1.45
s w	1.09	1.18	1.27	1.36	0.46	1.55	2.05	n w	2.15	2.26	2.35
sw b w	1.39	1.52	2.05	2.18	2.32	2.44	3.00	n w b w	3.15	3.31	3.45
w s w	2.27	2.45	3.04	3.23	3.43	4.03	4.25	n w	4.49	5.15	5.39
w by s	3.49	4.15	4.41	5.09	5.38			w b n			
West.	6.00										
☉ set.	6.00	5.58	5.54	5.51	5.47	5.44	5.40	☉ set.	5.37	5.23	5.20

A Sun Dial for the Latitude of 19 Degrees.

North Declination

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d		20 d	22 d	23 d
Min.	30m		30m		30m		30m				30m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	12	12	North	12	12	12
s by w	0.13	0.11	0.09	0.07	0.05	0.03	0.01	n by w	0.01	0.03	0.04
s s w	0.27	0.23	0.19	0.15	0.11	0.07	0.03	n n w	0.02	0.05	0.08
sw by s	0.43	0.37	0.30	0.24	0.18	0.11	0.05	n w b n	0.03	0.09	0.13
s w	1.03	0.54	0.45	0.36	0.27	0.17	0.07	n w	0.04	0.13	0.20
sw b w	1.35	1.18	1.05	0.52	0.38	0.24	0.05	n w b w	0.06	0.20	0.31
w s w	2.25	1.57	1.38	1.19	0.99	0.41	0.15	w n w	0.10	0.33	0.53
w by s	3.29	3.04	2.38	2.09	1.41	1.08	0.29	w b n	0.23		
West.	5.31	5.01	4.30	3.57	3.20	2.36	1.35				
w by n					5.52	5.17	4.40				
☉ set	6.03	6.07	6.10	6.14	6.17	6.21	6.24	☉ set	6.28	6.31	6.34
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.	d.m.
Amp.	2.38	5.17	7.56	10.35	13.14	15.53	18.33	Amp	21.12	23.20	24.58

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.32	0.34
s s w	0.31	0.35	0.38	0.42	1.46	0.50	0.54	0.58	1.03	1.07	1.09
sw by s	0.49	0.55	1.01	1.08	1.14	1.21	1.27	1.33	1.41	1.47	1.51
s w	1.12	1.21	1.30	1.39	1.48	1.58	2.07	2.16	2.29	2.37	2.44
sw b w	1.44	1.57	2.09	2.23	2.36	2.49	3.04	3.19	3.34	3.48	3.58
w s w	2.33	2.51	3.09	3.27	3.46	4.06	4.25	4.51	5.16	5.39	
w by s	4.54	4.19	4.44	5.10	5.39						
West.	6.00										
☉ set	6.00	5.57	5.53	5.50	5.46	5.43	5.39	5.36	5.32	5.20	5.26

The Mariners Compass Rectified.

A Sun-Dial for the Latitude of 20 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23
Min.	30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	P o	h m	h m
South	12	12	12	12	12	12	12	Nort.	12	12
s by w	0.14	0.12	0.10	0.08	0.06	0.04	0.02	n by w	0.02	0.01
s s w	0.28	0.25	0.21	0.17	0.13	0.09	0.05	n n w	0.04	0.02
sw by s	0.45	0.39	0.33	0.23	0.20	0.14	0.07	n w by n	0.06	0.03
s w	1.07	0.58	0.49	0.40	0.30	0.21	0.11	n w	0.09	0.05
sw by w	1.36	1.23	1.10	0.58	0.44	0.30	0.15	n w by w	0.13	0.07
w s w	2.21	2.03	1.45	1.26	1.07	0.46	0.24	w n w	0.22	0.11
w by s	3.37	3.11	2.45	2.20	1.52	1.21	0.45	w by n		
West	5.32	5.04	4.35	4.00	3.30	2.50	2.00			
w by n					5.54	5.23	4.47			
☉ set	6.03	6.07	6.11	6.15	6.18	6.22	6.26	☉ set	6.20	6.33
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.
Amp.	2.40	5.20	7.59	10.39	13.19	16.0	18.40	Amp.	21.20	23.29

Zen. West.

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.16	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	0.35
s s w	0.32	0.36	0.40	0.44	0.48	0.52	0.56	1.00	1.05	1.08	1.11
sw by s	0.51	0.58	1.04	1.10	1.12	1.23	1.29	1.36	1.43	1.49	1.55
s w	1.06	1.24	1.33	1.42	1.51	2.01	2.10	2.20	2.31	2.40	2.47
sw by w	1.48	2.01	2.14	2.26	2.39	2.53	3.07	3.25	3.37	3.50	4.00
w s w	2.38	2.55	3.13	3.31	3.50	4.09	4.30	4.52	5.16	5.38	
w by s	3.59	4.23	4.47	5.12	5.38						
West.	6.00										
☉ set	6.00	5.57	5.53	5.49	5.45	5.42	5.38	5.34	5.30	5.27	5.24

The Mariners Compass Rectified.

A Sun Dial for the Latitude of 21 Degrees.

North Declination

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d		22 d	23 d
Min.	30m		30m		30m		30m				30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m
South	12	12	12	12	12	12	12	12	North	12	12
by w	0.14	0.13	0.11	0.09	0.07	0.05	0.03	0.01	by w	0.01	0.02
s w	0.13	0.26	0.22	0.18	0.14	0.10	0.06	0.02	n w	0.02	0.04
w by s	0.48	0.42	0.35	0.29	0.23	0.16	0.10	0.03	n by w	0.03	0.07
s w	1.10	1.07	0.52	0.43	0.34	0.26	0.15	0.04	n w	0.04	0.11
w by w	1.40	1.27	1.16	1.03	0.49	0.36	0.21	0.06	n by w	0.06	0.17
s w	2.26	2.05	1.52	1.29	1.15	0.55	0.33	0.10	n w	0.11	0.40
by s	3.41	3.18	2.54	2.29	2.03	1.33	1.00	0.20	w by n	0.24	
West.	5.34	5.07	4.40	4.11	3.39	3.03	2.19	4.14			
by n					5.55	5.26	4.53	4.12			
set	6.04	6.08	6.12	6.16	6.20	6.25	6.28	6.32	set	6.35	6.38
Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's d.m.	d.m.	
amp.	2.41	5.21	8.02	10.43	13.24	16.6	18.47	21.29	Amp	23.40	25.18

South Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d		22 d	23 d
Min.	30m		30m		30m		30m				30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m
South	2	12	12	12	12	12	12	12	12	12	12
by w	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.35
s w	0.34	0.38	0.42	0.45	0.49	0.54	0.58	1.02	1.06	1.10	1.11
w by s	0.54	1.00	1.06	1.12	1.19	1.25	1.32	1.38	1.45	1.51	1.55
w	1.19	1.28	1.37	1.46	1.55	2.04	2.13	2.23	2.33	2.42	2.45
bw	1.53	2.05	2.18	2.30	2.43	2.56	3.10	3.24	3.39	3.52	4.02
s w	2.43	3.01	3.18	3.35	3.54	4.12	4.32	4.53	5.17		
by s	4.04	4.27	4.50	5.14	5.39						
West.	6.00										
set	6.00	5.56	5.52	5.48	5.44	5.40	5.35	5.32	5.28	5.25	5.22

A Sun-Dial for the Latitude of 22 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d		22 d	23 d
Min.	30m		30m		30m		30m			30m	
Point	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m
South	12	12	12	12	12	12	12	12	Nort.	12	12
s by w	0.15	0.13	0.11	0.09	0.08	0.06	0.04	0.02	n by w		
s s w	0.31	0.28	0.24	0.20	0.16	0.12	0.08	0.04	n n w		
sw by s	0.50	0.44	0.42	0.32	0.25	0.19	0.13	0.06	nw by n		
s w	1.14	1.05	0.56	0.47	0.38	0.29	0.19	0.08	n w		
swbw	1.45	1.33	1.20	1.08	0.55	0.41	0.27	0.13	nwbw		
w s w	2.30	2.15	1.58	1.40	1.22	1.03	0.42	0.20	w n w		
w by s	3.46	3.24	3.01	2.39	2.12	1.45	1.14	0.37			
West	5.25	5.10	4.44	4.17	3.47	3.14	2.35	1.43			
w by n					5.56	5.28	4.58	4.21			
☉ set	6.04	6.08	5.12	6.16	6.20	6.25	6.29	6.34	☉ set	6.37	6.41
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.	d.m.
Amp.	2.42	5.23	8.05	10.48	13.30	16.13	18.55	21.39	Amp.	23.50	25.40

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m		30m	
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.17	0.19	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.35
s s w	0.35	0.39	0.43	0.47	0.51	0.55	0.59	1.03	1.07	1.11	1.14
sw by s	0.56	1.02	1.08	1.14	1.21	1.27	1.33	1.40	1.47	1.52	1.56
s w	1.22	1.31	1.40	1.49	1.58	2.07	2.16	2.25	2.36	2.44	2.51
swbw	1.57	2.09	2.21	2.34	2.46	2.59	3.13	3.27	3.42	3.54	4.04
w s w	2.49	3.05	3.22	3.39	3.57	4.15	4.34	4.55	5.17		
w by s	4.08	4.30	4.52	5.15	5.39						
West	6.00										
☉ set	6.00	5.56	5.52	5.48	5.44	5.40	5.35	5.31	5.26	5.23	5.20

The Mariners Compass Rectified.

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A Sun-Dial for the Latitude of 23 Degrees.

North Declination.

deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d		23 d
in.	30m		30m		30m		30m				30m
point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m
outh	12	12	12	12	12	12	12	12	12	Nort.	12
by w	0.16	0.15	0.13	0.11	0.09	0.07	0.05	0.03	0.01	n by w	0.00
s w	0.33	0.30	0.26	0.22	0.18	0.14	0.10	0.05	0.02	n w	0.01
bys	0.53	0.47	0.41	0.34	0.28	0.22	0.16	0.09	0.03	n w bn	0.01
w	1.17	1.08	1.00	0.50	0.41	0.32	0.22	0.13	0.04	n w	0.02
bw	1.49	1.37	1.25	1.13	1.00	0.47	0.33	0.19	0.06	n w bw	0.03
s w	2.37	2.21	2.04	1.47	1.29	1.11	0.51	0.29	0.10	n w	0.06
bys	3.51	3.30	3.08	2.45	2.21	1.55	1.26	0.59	0.26		
elt.	5.36	5.12	4.48	4.22	3.54	3.23	2.48	2.04	1.11		
by n				6.21	5.57	5.31	5.02	4.29	3.56		
let	6.04	6.09	6.13	6.17	6.22	6.26	6.21	6.36	6.39	☉ set	6.43
n's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	Sun's	d.m.
mp.	2.43	5.26	8.10	10.52	13.36	16.20	19.4	21.49	24.11	Amp	25.41

South Declination.

deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
in.		30m		30m		30m		30m			30m
point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
outh	12	12	12	12	12	12	12	12	12	12	12
by w	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.35	0.36
s w	0.37	0.41	0.44	0.48	0.51	0.55	0.59	1.03	1.08	1.12	1.15
bys	0.59	1.04	1.10	1.16	1.23	1.29	1.35	1.41	1.49	1.54	1.55
w	1.25	1.34	1.43	1.51	2.00	2.10	2.19	2.28	2.39	2.46	2.5
bw	2.01	2.13	2.25	2.37	2.50	3.02	3.10	3.29	3.44	3.56	4.00
s w	2.53	3.10	3.26	3.43	4.00	4.17	4.36	4.56	5.17		
bys	4.12	4.33	4.54	5.16	5.39						
elt.	6.00										
let.	6.00	5.56	5.5	5.47	5.43	5.38	5.34	5.29	5.24	5.21	5.17

A Sun-Dial for the Latitude of 24 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12
s by w	0.17	0.15	0.13	0.1	0.09	0.08	0.06	0.04	0.02	0.00
s s w	0.35	0.35	0.27	0.23	0.19	0.15	0.11	0.07	0.04	0.01
sw by s	0.55	0.49	0.43	0.37	0.30	0.24	0.18	0.11	0.06	0.01
s w	1.20	1.12	1.03	0.53	0.44	0.35	0.25	0.17	0.09	0.02
sw by w	1.54	1.42	1.30	1.18	1.05	0.52	0.39	0.21	0.13	0.03
w s w	2.42	2.26	2.10	1.53	1.36	1.18	0.59	0.38	0.20	0.05
w by s	3.56	3.35	3.14	2.52	2.29	2.05	1.34	1.07	0.33	0.10
West.	5.37	5.15	4.51	4.27	4.01	3.32	3.00	2.21	1.39	0.49
w by n				6.21	5.58	5.33	5.06	4.35	4.06	3.39
w n w									6.24	5.09
☉ set	6.04	6.09	6.13	6.18	6.23	6.27	6.32	6.37	6.41	6.45
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	2.44	5.28	8.13	10.57	13.42	16.27	19.13	21.59	24.12	25.54

South Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12
s by w	0.18	0.20	0.22	0.24	0.26	0.28	0.29	0.31	0.33	0.35
s s w	0.38	0.42	0.46	0.50	0.53	0.57	1.01	1.05	1.10	1.13
sw by s	1.01	1.07	1.13	1.19	1.25	1.31	1.37	1.44	1.50	1.56
s w	1.29	1.37	1.46	1.54	2.04	2.13	2.23	2.32	2.40	2.49
sw by w	2.05	2.17	2.29	2.41	2.53	3.05	3.18	3.32	3.46	3.58
w s w	2.58	3.14	3.30	3.46	4.02	4.20	4.38	4.57	5.18	
w by s	4.16	4.36	4.56	5.17	5.39					
West.	6.00									
☉ set	6.00	5.56	5.51	5.47	5.42	5.37	5.33	5.28	5.23	5.19

A Sun-Dial for the Latitude of 25 Degrees.

North Declination.

deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
lin.		30m		30m		30m		30m			
int.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
uth	12	12	12	12	12	12	12	12	12	12	12
y w	0.19	0.17	0.16	0.14	0.12	0.10	0.08	0.06	0.04	0.02	0.01
s w	0.40	0.36	0.32	0.29	0.25	0.21	0.17	0.13	0.09	0.05	0.03
bys	1.03	0.57	0.51	0.45	0.39	0.33	0.27	0.21	0.14	0.09	0.04
w	1.32	1.23	1.15	1.06	0.97	0.49	0.40	0.31	0.21	0.13	0.06
bw	2.09	1.58	1.46	1.35	1.22	1.10	0.98	0.44	0.31	0.19	0.10
sw	3.02	2.47	2.32	2.16	2.00	1.43	1.25	1.07	0.47	0.29	0.15
bs	4.19	4.00	3.40	3.20	2.59	2.27	2.14	1.48	1.19	0.53	0.29
est.	6.00	5.38	5.17	4.54	4.31	4.06	3.40	3.10	2.35	2.00	1.24
byn					6.21	5.59	5.36	5.10	4.41	4.14	3.50
n w									6.25	6.10	
let	6.00	6.05	6.09	6.14	6.19	6.24	6.29	6.34	6.39	6.43	6.47
un's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
mp.	0.00	2.45	5.31	8.16	11.3	13.45	16.35	19.22	22.10	24.25	26.7

South Declination.

deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
lin.		30m		30m		30m		30m			
int.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
uth	12	12	12	12	12	12	12	12	12	12	12
y w	0.19	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38
sw	0.40	0.42	0.47	0.51	0.55	0.59	1.02	1.06	1.11	1.14	1.17
bys	1.03	1.09	1.15	1.21	1.27	1.33	1.39	1.46	1.52	1.58	2. 2
w	1.32	1.40	1.48	1.57	2.06	2.14	2.23	2.33	2.42	2.59	2.57
bw	2.09	2.21	2.32	2.44	2.56	3.08	3.21	3.34	3.48	4.00	4.09
sw	3.02	3.18	3.33	3.46	4.05	4.22	4.39	4.58	5.19		
bs	4.19	4.39	4.58	5.18	5.39						
est.	6.00										
let.	6.00	5.55	5.51	5.46	5.41	5.36	5.31	5.26	5.21	5.17	5.13

*A Sun-Dial for the Latitude of 26 Degrees.***North Declination.**

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.20	0.18	0.16	0.14	0.13	0.11	0.09	0.07	0.05	0.03	0.02
s s w	0.41	0.38	0.34	0.30	0.26	0.23	0.19	0.15	0.10	0.07	0.04
sw by s	1.05	0.59	0.54	0.48	0.42	0.36	0.30	0.24	0.17	0.11	0.07
s w	1.35	1.26	1.18	1.10	1.01	0.52	0.43	0.34	0.25	0.17	0.11
sw by w	2.13	2.02	1.50	1.39	1.27	1.15	1.03	0.50	0.36	0.25	0.16
w s w	3.07	2.52	2.37	2.21	2.06	1.49	1.32	1.14	0.55	0.38	0.25
w by s	4.22	4.04	3.45	3.25	3.06	2.45	2.18	1.58	1.31	1.07	0.45
West	6.00	5.39	5.19	4.57	4.35	4.12	3.47	3.19	2.47	2.06	1.47
w by n					6.21	6.00	5.38	5.13	4.46	4.22	4.00
w n w									6.42	6.35	6.12
☉ set	6.00	6.05	6.10	6.15	6.20	6.25	6.30	6.35	6.41	6.45	6.49
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	2.46	5.34	8.20	11.8	13.56	16.44	19.33	22.22	24.38	26.22

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.20	0.22	0.24	0.25	0.27	0.29	0.31	0.33	0.35	0.36	0.38
s s w	0.41	0.45	0.49	0.52	0.56	1.00	1.04	1.08	1.12	1.15	1.18
sw by s	1.05	1.11	1.17	1.23	1.29	1.35	1.41	1.47	1.54	1.59	2.03
s w	1.35	1.42	1.51	2.00	2.08	2.17	2.26	2.35	2.44	2.52	2.59
sw by w	2.13	2.24	2.36	2.47	2.59	3.11	3.23	3.36	3.50	4.01	4.10
w s w	3.07	3.21	3.37	3.52	4.07	4.24	4.41	4.59	5.18		
w by s	4.22	4.41	5.00	5.19							
West	6.00										
☉ set	6.00	5.55	5.50	5.45	5.40	5.35	5.30	5.25	5.19	5.15	5.11

A Sun-Dial for the Latitude of 27 Degrees.

North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d	
Min.		30m		30m		30m		30m			30m	
Points	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.21	0.19	0.17	0.15	0.13	0.12	0.10	0.08	0.06	0.04	0.03	
s s w	0.43	0.39	0.35	0.32	0.28	0.24	0.20	0.17	0.12	0.09	0.06	
sw by s	1.07	1.02	0.56	0.50	0.45	0.39	0.33	0.27	0.20	0.13	0.10	
s w	1.38	1.30	1.21	1.13	1.05	0.56	0.47	0.38	0.29	0.21	0.15	
swb w	2.17	2.06	1.55	1.43	1.32	1.20	1.08	0.55	0.42	0.32	0.23	
w s w	3.10	2.56	2.41	2.26	2.11	1.55	1.39	1.22	1.03	0.47	0.34	
w by s	4.25	4.07	3.49	3.31	3.11	2.51	2.30	2.07	1.42	1.19	0.59	
West.	6.00	5.40	5.21	5.00	4.39	4.17	3.53	3.27	2.58	2.30	2.05	
w by n					6.21	6.01	5.39	5.17	4.51	4.28	4.09	
w n w									6.42	6.26	6.13	
☉ feb.	6.00	6.05	6.10	6.15	6.21	6.26	6.31	6.73	6.43	6.48	6.51	
Sun's	d	md	md	md	md	md	md	md	md	md	md	m
Amp.	0.00	2.48	5.36	8.25	11.14	1.43	16.53	19.43	22.34	24.52	26.	

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d	
Min.		30m		30m		30m		30m			30m	
Points	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.21	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.37	0.38	
s s w	0.43	0.46	0.50	0.53	0.57	1.01	1.05	1.09	1.13	1.16	1.19	
sw by s	1.07	1.13	1.19	1.25	1.30	1.36	1.42	1.48	1.55	2.02	2.05	
s w	1.38	1.46	1.54	2.02	2.11	2.19	2.28	2.37	2.45	2.54	3.00	
swb w	2.17	2.28	2.39	2.50	3.02	3.1	3.26	3.38	3.52	4.01	4.10	
w s w	3.10	3.25	3.42	3.54	4.10	4.23	4.42	4.59	5.18			
w by s	4.25	4.43	5.02	5.20	5.39							
West.	6.00											
☉ feb.	6.00	5.55	5.50	5.45	5.39	5.34	5.29	5.23	5.17	5.12	5.09	

A Sun-Dial for the Latitude of 28 Degrees.

North Declination.

Deg.	d	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.21	0.20	0.18	0.16	0.14	0.13	0.11	0.09	0.07	0.05	0.04	
s s w	0.44	0.40	0.37	0.33	0.30	0.26	0.22	0.18	0.14	0.11	0.08	
sw by s	1.10	1.04	0.98	0.93	0.87	0.81	0.75	0.69	0.62	0.56	0.50	
s w	1.41	1.33	1.25	1.17	1.08	1.00	0.91	0.82	0.73	0.64	0.55	
sw w	2.20	2.10	1.99	1.88	1.76	1.65	1.53	1.41	1.29	1.17	1.05	
w s w	3.14	3.00	2.86	2.71	2.57	2.41	2.26	2.11	1.95	1.79	1.63	
w by s	4.28	4.11	3.93	3.75	3.57	3.39	3.21	3.03	2.85	2.67	2.49	
West.	6.00	5.41	5.22	5.04	4.43	4.21	3.99	3.75	3.51	3.27	3.03	
w by n					6.21	6.04	5.41	5.21	4.56	4.34	4.10	
w n w									6.42	6.27	6.10	
☉ set	6.00	6.05	6.11	6.16	6.22	6.27	6.33	6.39	6.45	6.50	6.55	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	2.50	5.40	8.30	11.21	14.11	17.3	19.56	22.48	25.6	26.5	

South Declination.

Deg.	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.	30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12
s by w	0.21	0.33	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38
s s w	0.44	0.48	0.51	0.55	0.58	1.02	1.06	1.10	1.14	1.17
sw by s	1.10	1.15	1.21	1.27	1.32	1.38	1.44	1.51	1.57	2.03
s w	1.41	1.49	1.57	2.05	2.13	2.21	2.30	2.39	2.47	2.56
sw w	2.20	2.31	2.42	2.53	3.04	3.16	3.28	3.40	3.53	4.04
w s w	3.14	3.28	3.43	3.57	4.12	4.27	4.43	5.00	5.18	
w by s	4.28	4.45	5.03	5.21	5.39					
West.	6.00									
☉ set	6.00	5.55	5.49	5.44	5.38	5.33	5.27	5.21	5.15	5.10

The Mariners Compass Rectified.

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A Sun Dial for the Latitude of 29 Degrees.

North Declination

Deg.	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.	30m		30m		30m		30m		30m	
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12
s by w	0.22	0.20	0.19	0.17	0.15	0.13	0.11	0.10	0.08	0.05
s s w	0.45	0.42	0.38	0.35	0.31	0.27	0.23	0.19	0.16	0.10
sw by s	1.12	1.06	1.01	0.95	0.49	0.43	0.37	0.31	0.25	0.20
s w	1.43	1.36	1.28	1.20	1.12	1.03	0.94	0.86	0.77	0.68
sw by w	2.24	2.13	2.03	1.92	1.41	1.30	1.18	1.06	0.93	0.84
w s w	3.18	3.04	2.50	2.36	2.22	2.07	1.92	1.75	1.61	1.41
w by s	4.31	4.14	3.57	3.40	3.22	3.04	2.45	2.24	2.01	1.81
West.	6.00	5.42	5.24	5.05	4.46	4.26	4.04	3.41	3.16	2.33
w by n					6.21	6.02	5.43	5.22	5.01	4.40
w n w								6.42	6.27	6.15
☉ set	6.00	6.06	6.11	6.17	6.23	6.28	6.34	6.40	6.47	6.56
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	2.51	5.43	8.34	11.27	14.19	17.12	20.08	24.32	27.8

South Declination.

Deg.	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.	30m		30m		30m		30m		30m	
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12
s by w	0.22	0.24	0.26	0.27	0.29	0.31	0.33	0.35	0.37	0.38
s s w	0.45	0.49	0.53	0.56	1.00	1.04	1.08	1.11	1.15	1.21
sw by s	1.12	1.17	1.23	1.29	1.34	1.40	1.46	1.52	1.59	2.04
s w	1.43	1.51	1.59	2.07	2.15	2.24	2.32	2.41	2.51	2.58
sw by w	2.24	2.34	2.45	2.56	3.07	3.18	3.30	3.42	3.55	4.05
w s w	3.18	3.32	3.46	4.00	4.14	4.29	4.44	5.00		4.14
w by s	4.31	4.48	5.04	5.22	5.39					
West.	6.00									
☉ set	6.00	5.54	5.49	5.43	5.37	5.32	5.26	5.20	5.15	5.08

*A Sun-Dial for the Latitude of 30 Degrees.***North Declination.**

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.21	0.19	0.18	0.16	0.14	0.12	0.10	0.08	0.07	0.06
s s w	0.47	0.43	0.40	0.36	0.33	0.29	0.25	0.21	0.17	0.14	0.12
sw by s	1.14	1.08	1.03	0.98	0.92	0.86	0.80	0.74	0.68	0.63	0.59
s w	1.46	1.38	1.30	1.23	1.15	1.07	0.98	0.90	0.81	0.73	0.67
sw by w	2.27	2.17	2.06	1.95	1.84	1.73	1.61	1.50	1.38	1.28	1.19
w s w	3.21	3.08	2.55	2.41	2.27	2.13	1.98	1.82	1.65	1.51	1.35
w by s	4.33	4.17	4.01	3.84	3.67	3.50	3.31	3.13	2.94	2.78	2.61
West.	6.00	5.43	5.25	5.07	4.49	4.30	4.09	3.48	3.24	3.02	2.44
w by n					6.21	6.03	5.45	5.25	5.03	4.45	4.29
w n w									6.42	6.28	6.17
☉ set	6.00	6.06	6.12	6.18	6.23	6.29	6.36	6.42	6.48	6.54	6.59
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	2.53	5.46	8.40	11.34	14.28	17.22	20.18	23.16	25.58	27.25

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.24	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.40
s s w	0.47	0.50	0.54	0.57	1.01	1.05	1.08	1.12	1.16	1.19	1.22
sw by s	1.11	1.19	1.25	1.30	1.36	1.42	1.48	1.54	2.00	2.05	2.09
s w	1.46	1.54	2.02	2.10	2.18	2.26	2.34	2.43	2.52	2.59	3.05
sw by w	2.27	2.38	2.48	2.58	3.09	3.20	3.32	3.43	3.56	4.06	4.14
w s w	3.21	3.35	3.48	4.01	4.16	4.30	4.45	5.01			
w by s	3.33	4.49	5.05	5.22	5.39						
West.	6.00										
☉ set	6.00	5.54	5.48	5.42	5.37	5.31	5.24	5.18	5.12	5.06	5.01

A Sun-Dial for the Latitude of 31 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 25	d
Min.		30m		30m		30m		30m				
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
by w	0.23	0.22	0.20	0.18	0.17	0.15	0.13	0.11	0.09	0.08	0.07	
ss w	0.48	0.45	0.41	0.38	0.34	0.31	0.27	0.23	0.19	0.16	0.13	
sw by s	1.16	1.11	1.05	1.00	0.54	0.48	0.43	0.37	0.31	0.25	0.21	
s w	1.49	1.41	1.34	1.26	1.18	1.10	1.02	0.53	0.45	0.37	0.32	
sw by w	2.30	2.20	2.10	2.00	1.49	1.38	1.27	1.16	1.04	0.54	0.46	
w s w	3.25	3.12	2.59	2.45	2.32	2.18	2.03	1.48	1.32	1.18	1.07	
w by s	4.36	4.20	4.04	3.48	3.32	3.15	2.57	2.38	2.18	2.00	1.46	
West.	6.00	5.43	5.26	5.09	4.52	4.33	4.14	3.53	3.31	3.11	2.55	
w by n					6.21	5.04	5.46	5.27	5.07	4.49	4.35	
n w									6.43	6.29	6.18	
set	6.00	6.05	6.12	6.18	6.24	6.31	6.37	6.44	6.51	6.56	7.01	
Suns	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	2.55	5.50	8.45	11.41	14.37	17.34	20.31	23.31	25.55	27.43	

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 25	d
Min.		30m		30m		30m		30m				30m
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
by w	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38	0.39	0.40	
sw	0.48	0.52	0.55	0.59	1.02	1.06	1.10	1.13	1.17	1.2	1.23	
sw by s	1.16	1.21	1.27	1.32	1.38	1.44	1.49	1.55	2.01	2.07	2.11	
s w	1.49	1.57	2.04	2.12	2.20	2.28	2.36	2.45	2.53	3.01	3.06	
sw by w	2.30	2.41	2.51	3.01	3.12	3.23	3.34	3.45	3.57	4.07	4.15	
w s w	3.25	3.38	3.51	4.04	4.18	4.32	4.46	5.01	5.17			
w by s	4.36	4.50	5.07	5.23								
West.	6.00											
set.	6.00	5.54	5.48	5.42	5.36	5.2	5.23	5.16	5.09	4.04	4.59	

*A Sun-Dial for the Latitude of 32 Degrees.***North Declination.**

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.24	0.22	0.21	0.19	0.17	0.16	0.14	0.12	0.10	0.09	0.07
s s w	0.50	0.45	0.43	0.39	0.36	0.32	0.29	0.25	0.21	0.18	0.16
sw by s	1.18	1.13	1.07	1.02	0.96	0.91	0.85	0.79	0.73	0.68	0.62
s w	1.52	1.44	1.37	1.29	1.22	1.14	1.05	0.96	0.88	0.81	0.73
sw by w	2.34	2.24	2.14	2.04	1.54	1.43	1.32	1.21	1.09	0.95	0.81
w s w	3.28	3.15	3.03	2.50	2.37	2.23	2.09	1.54	1.39	1.25	1.15
w by s	4.38	4.23	4.38	3.52	3.37	3.20	3.03	2.45	2.26	2.09	1.55
West	6.00	5.44	5.28	5.11	4.55	4.37	4.21	3.59	3.38	3.19	3.04
w by n					6.22	6.05	5.48	5.30	5.10	4.53	4.39
w n w									6.43	6.30	6.19
☉ set	5.00	6.06	6.13	6.19	6.25	6.32	6.39	6.46	6.53	6.58	7.00
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	2.57	5.54	8.51	11.48	14.47	17.46	19.47	22.47	26.43	28.50

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.24	0.26	0.27	0.29	0.31	0.33	0.34	0.36	0.38	0.40	0.41
s s w	0.50	0.53	0.56	1.00	1.03	1.07	1.10	1.14	1.18	1.21	1.24
sw by s	1.18	1.23	1.29	1.34	1.40	1.45	1.51	1.57	2.03	2.08	2.13
s w	1.52	1.59	2.07	2.14	2.22	2.30	2.38	2.45	2.51	3.02	3.08
sw by w	2.34	2.44	2.54	3.04	3.14	3.25	3.35	3.47	3.59	4.08	4.16
w s w	3.28	3.41	3.53	4.06	4.19	4.33	4.47	5.02			
w by s	4.38	4.53	5.08	5.53							
West	6.00										
☉ set	6.00	5.54	5.47	5.41	5.25	5.28	5.21	5.14	5.07	5.02	4.50

A Sun-Dial for the Latitude of 33 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.25	0.23	0.21	0.20	0.18	0.16	0.10	0.13	0.11	0.09	0.08
ss w	0.51	0.47	0.44	0.41	0.37	0.34	0.30	0.27	0.23	0.19	0.17
sw by s	1.20	1.15	1.09	1.04	0.99	0.93	0.88	0.82	0.76	0.71	0.67
s w	1.54	1.47	1.40	1.32	1.24	1.17	1.09	1.01	0.93	0.86	0.81
sw by w	2.37	2.27	2.17	2.07	1.97	1.87	1.76	1.65	1.54	1.44	1.37
w s w	3.31	3.19	3.05	2.54	2.41	2.28	2.14	2.00	1.85	1.72	1.62
w by s	4.40	4.25	4.11	3.56	3.41	3.25	3.09	2.51	2.33	2.17	2.04
West.	6.00	5.45	5.29	5.13	4.57	4.40	4.23	4.04	3.44	3.27	3.12
w by n					6.21	5.05	5.49	5.32	5.15	4.57	4.44
w n w									6.43	6.30	6.20
@ set.	6.00	6.07	6.13	6.20	6.26	6.33	6.40	6.47	6.55	7.01	7.06
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	2.59	5.58	8.57	11.57	14.57	17.58	21.1	24.24	25.31	28.24

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.25	0.26	0.28	0.30	0.31	0.32	0.35	0.37	0.39	0.40	0.41
ss w	0.51	0.54	0.58	1.01	1.05	1.08	1.12	1.15	1.19	1.22	1.25
sw by s	1.20	1.25	1.30	1.36	1.41	1.47	1.52	1.58	2.04	2.09	2.13
s w	1.54	2.02	2.09	2.17	2.24	2.32	2.40	2.48	2.58	3.05	3.10
sw by w	2.37	2.46	2.56	3.06	3.16	3.27	3.37	3.48	4.00	4.09	4.17
w s w	3.31	3.43	3.56	4.08	4.21	4.34	4.48	5.02			
w by s	4.40	4.54	5.09	5.24							
West.	6.00										
@ set.	6.00	5.53	5.47	5.40	5.34	5.27	5.20	5.13	5.05	4.59	4.54

A Sun-Dial for the Latitude of 34 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 24
Min.		30m		30m		30m		30m		30m	
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.25	0.24	0.22	0.20	0.19	0.17	0.15	0.14	0.12	0.10	0.09
s s w	0.52	0.49	0.45	0.42	0.39	0.35	0.32	0.28	0.24	0.21	0.19
sw by s	1.22	1.17	1.12	1.07	1.01	0.55	0.50	0.44	0.38	0.34	0.30
s w	2.57	1.50	1.42	1.35	1.28	1.20	1.12	1.04	0.56	0.49	0.43
sw by w	2.40	2.30	2.21	2.11	2.01	1.51	1.41	1.30	1.19	1.09	1.02
w s w	3.35	3.22	3.10	2.58	2.45	2.33	2.19	2.06	1.51	1.39	1.29
w by s	4.42	4.28	4.14	3.59	3.45	3.30	3.14	2.57	2.40	2.24	2.12
West.	6.00	5.45	5.30	5.15	5.00	4.43	4.26	4.09	3.49	3.33	3.19
w by n					6.21	6.06	5.50	5.32	5.16	5.01	4.49
w n w									6.43	6.31	6.21
☉ set.	6.00	6.07	6.14	6.20	6.27	6.34	6.42	6.49	6.57	7.03	7.08
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.01	6.01	9.03	12.5	15.8	18.12	21.16	24.22	26.52	28.4

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.25	0.27	0.29	0.30	0.32	0.34	0.35	0.37	0.39	0.41	0.42
s s w	0.52	0.55	0.59	1.02	1.06	1.09	1.13	1.16	1.20	1.23	1.26
sw by s	1.22	1.27	1.32	1.38	1.43	1.48	1.54	2.00	2.05	2.10	2.14
s w	1.57	2.04	2.11	2.19	2.26	2.34	2.42	2.50	2.58	3.05	3.10
sw by w	2.24	2.49	2.59	3.09	3.18	3.28	3.39	3.50	4.01	4.10	4.18
w s w	3.34	3.46	3.58	4.10	4.22	4.35	4.48	5.02			
w by s	4.42	4.56	5.10	5.24							
West	6.00										
☉ set.	6.00	5.52	5.46	5.40	5.33	5.26	5.18	5.11	5.03	4.57	4.5

A Sun Dial for the Latitude of 5 Degrees.

North Declination

North Declination																									
d	2d	deg.	0	d	2	d	5	d	7	d	10d.	12	d	15	d	17	d	20	d	22	d	23	d		
30m		in.		30m		30m		30m		30m		30m		30m		30m		30m		30m		30m			
n	h	m		point	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	
2	12			uth	12		12		12		12		12		12		12		12		12		12		
0	0.09			y w	0.26		0.24		0.23		0.21		0.19		0.18		0.16		0.14		0.13		0.11		0.10
1	0.19			s w	0.53		0.15		0.47		0.44		0.40		0.37		0.33		0.30		0.26		0.23		0.20
4	0.30			bys	1.24		1.19		1.14		1.08		1.03		0.58		0.52		0.47		0.41		0.36		0.32
9	0.43			w	1.59		1.52		1.45		1.38		1.31		1.23		1.15		1.08		0.99		0.93		0.47
9	1.02			b w	2.43		2.33		2.24		2.14		2.05		1.55		1.45		1.34		1.23		1.14		1.07
9	1.29			s w	3.27		3.25		3.13		3.02		2.50		2.37		2.24		2.11		1.57		1.45		1.36
4	2.12			by s	4.43		4.29		4.16		4.03		3.48		3.34		3.19		3.01		2.46		2.31		2.20
3	3.19			est.	6.00		5.46		5.31		5.17		5.02		4.46		4.30		4.13		3.55		3.39		3.26
01	4.49			byn							6.21		6.07		5.52		5.38		5.19		5.04		4.53		
31	6.21			n w															6.44		6.32		6.22		
23	7.08			et.	6.00		6.07		6.14		6.21		6.28		6.35		6.43		6.51		6.55		7.00		7.11
n.	d.	m.		n's.	d.	m.	d.	m.	d.	m.	d.	m.	d.	m.	d.	m.	d.	m.	d.	m.	d.	m.	d.	m.	
52	28.4			ap.	0.00		3.03		6.06		9.10		12.14		15.18		18.25		21.32		24.40		27.12		29.8

South Declination.

d	23 d	30m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
deg.	0	d	2	d	5	d	7	d	10	d	12	d	15	d	17	d	20	d	22	d	23	d
in.		30m		30m		30m		30m		30m		30m		30m		30m		30m		30m		30m
point	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
uth	12		12		12		12		12		12		12		12		12		12		12	
y w	0.26		0.28		0.29		0.31		0.33		0.34		0.36		0.38		0.40		0.41		0.42	
w	0.53		0.57		1.00		1.04		1.07		1.10		1.14		1.17		1.21		1.24		1.27	
ys	1.24		1.29		1.34		1.39		1.45		1.50		1.55		2.01		2.07		2.12		2.15	
v	1.59		2.06		2.14		2.21		2.28		2.36		2.43		2.51		2.59		3.06		3.11	
w	2.43		2.52		3.01		3.11		3.20		3.30		3.40		3.51		4.02		4.11		4.18	
w	3.27		3.48		4.00		4.12		4.24		4.36		4.49		5.02							
ys	4.43		4.57		5.11		5.24															
ft.	6.00																					
et	6.00		5.53		5.46		5.39		5.32		5.25		5.17		5.09		5.01		4.54		4.49	

A Sun-Dial for the Latitude of 36 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Points	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.25	0.23	0.22	0.20	0.19	0.17	0.15	0.13	0.12	0.11
s s w	0.55	0.51	0.48	0.45	0.42	0.38	0.35	0.31	0.28	0.24	0.22
sw by s	1.26	1.21	1.16	1.11	1.05	1.00	0.55	0.49	0.44	0.39	0.35
s w	2.02	1.55	1.48	1.41	1.34	1.26	1.19	1.11	1.04	0.56	0.50
s w b w	2.45	2.36	2.27	2.18	2.08	1.59	1.49	1.39	1.28	1.19	1.11
w s w	3.39	3.28	3.17	3.05	2.53	2.41	2.29	2.16	2.03	1.51	1.41
w by s	4.45	4.32	4.19	4.06	3.52	3.38	3.23	3.08	2.52	2.38	2.24
West.	6.00	5.46	5.32	5.18	5.04	4.49	4.33	4.17	4.00	3.45	3.31
w by n					6.22	6.08	5.53	5.38	5.22	5.08	4.94
w n w									6.44	6.33	6.22
☉ set	6.00	6.07	6.15	6.22	6.29	6.37	6.45	6.53	7.01	7.08	7.16
Sun s	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp	0.00	3.06	5.11	6.17	7.24	8.31	9.40	10.49	11.58	12.59	13.59

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Points	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.28	0.30	0.31	0.33	0.35	0.36	0.38	0.40	0.41	0.42
s s w	0.55	0.58	1.01	1.05	1.08	1.11	1.15	1.18	1.22	1.25	1.28
sw by s	1.26	1.31	1.36	1.41	1.46	1.51	1.57	2.02	2.08	2.13	2.18
s w	2.02	2.09	2.16	2.23	2.30	2.27	2.45	2.53	3.01	3.07	3.14
sw b w	2.45	2.54	3.04	3.13	3.22	3.32	3.42	3.52	4.03	4.12	4.21
w s w	3.39	3.51	4.02	4.13	4.25	4.37	4.49	5.02			
w by s	4.45	4.58	5.11	5.25							
West.	6.00										
☉ set	6.00	5.52	5.45	5.38	5.31	5.23	5.15	5.07	4.59	4.52	4.44

A Sun-Dial for the Latitude of 37 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Points	h	m	h	m	h	m	h	m	h	m	m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.27	0.26	0.24	0.23	0.21	0.19	0.18	0.16	0.14	0.13	0.12
s w	0.56	0.53	0.50	0.46	0.43	0.40	0.36	0.33	0.29	0.26	0.24
w by s	1.28	1.23	1.18	1.13	1.08	1.02	0.57	0.52	0.47	0.41	0.38
s w	2.04	1.57	1.50	1.43	1.36	1.29	1.22	1.14	1.07	1.00	0.55
wb w	2.48	2.39	2.30	2.21	2.12	2.03	1.53	1.43	1.33	1.24	1.17
s w	3.42	3.31	3.20	3.09	2.57	2.46	2.34	2.21	2.08	1.57	1.48
w by s	4.47	4.34	4.21	4.09	3.56	3.42	3.28	3.13	2.58	2.45	2.34
West.	6.00	5.47	5.33	5.19	5.06	4.52	4.37	4.21	4.05	3.50	3.39
by n					6.22	6.08	5.54	5.40	5.24	5.11	5.00
n w									6.44	6.33	6.25
12	6.00	6.08	6.15	6.23	6.31	6.39	6.47	6.55	7.04	7.11	7.17
un's	d	md	md	md	md	md	md	md	md	md	md
mp.	0.00	3.08	6.16	9.25	12.33	16.2	18.55	22.7	25.22	27.58	29.58

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Points	h	m	h	m	h	m	h	m	h	m	m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.27	0.29	0.31	0.32	0.34	0.35	0.37	0.39	0.41	0.42	0.43
s w	0.56	0.59	1.02	1.06	0.09	1.12	1.16	1.19	1.23	1.26	1.22
w by s	1.28	1.33	1.37	1.42	1.47	1.53	1.58	2.04	2.09	2.14	2.17
w	2.04	2.11	2.18	2.24	2.32	2.39	2.46	2.54	3.01	3.08	3.13
wb w	2.48	2.57	3.06	3.15	3.24	3.33	3.43	3.53	4.03	4.12	4.19
s w	3.42	3.53	4.04	4.15	4.26	4.38	4.50	5.03			
by s	4.47	5.00	5.12	5.25							
West.	6.00										
12	6.00	5.52	5.45	5.37	5.29	5.21	5.13	5.05	4.56	4.49	4.43

A Sun Dial for the Latitude of 38 Degrees.

North Declination.

Deg. Min.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Points	h	mh	mh	mh	mh	mh	mh	mh	mh	mh	mh
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.28	0.26	0.25	0.23	0.21	0.20	0.18	0.17	0.15	0.13	0.12
s s w	0.57	0.54	0.51	0.48	0.45	0.41	0.38	0.34	0.31	0.28	0.26
sw by s	1.29	1.24	1.20	1.15	1.10	1.05	1.00	0.54	0.49	0.44	0.40
s w	2.06	2.00	1.53	1.46	1.39	1.32	1.25	1.18	1.10	1.04	0.98
s w b w	2.51	2.42	2.33	2.24	2.15	2.06	1.57	1.47	1.37	1.29	1.21
w s w	3.44	3.34	3.23	3.12	3.01	2.50	2.39	2.26	2.13	2.03	1.94
w by s	4.48	4.36	4.24	4.12	4.01	3.46	3.33	3.18	3.03	2.50	2.40
West.	6.00	5.47	5.34	5.21	5.08	4.54	4.45	4.25	4.09	3.55	3.40
w by n					6.22	6.09	5.56	5.41	5.26	5.14	5.00
w n w									6.45	6.34	6.21
☉ set.	6.00	6.06	6.16	6.24	6.32	6.40	6.48	6.57	7.06	7.14	7.21
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp	0.06	3.10	6.21	9.32	12.43	15.58	19.10	22.26	25.43	28.23	30.00

South Declination.

Deg. Min.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Points	h	mh	mh	mh	mh	mh	mh	mh	mh	mh	mh
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.28	0.30	0.31	0.33	0.34	0.36	0.38	0.39	0.41	0.42	0.43
s s w	0.57	1.00	1.04	1.07	1.10	1.13	1.16	1.20	1.24	1.27	1.30
sw by s	1.29	1.34	1.39	1.44	1.49	1.54	1.59	2.05	2.10	2.15	2.20
s w	2.06	2.13	2.20	2.27	2.34	2.41	2.48	2.55	3.03	3.09	3.16
sw b w	2.51	2.59	3.08	3.17	3.26	3.35	3.44	3.54	4.04	4.13	4.21
w s w	3.44	3.55	4.06	4.17	4.28	4.39	4.50	5.02			
w by s	4.48	5.00	5.13	5.25							
West.	6.00										
☉ set.	6.00	5.52	5.44	5.36	5.28	5.20	5.12	5.03	4.54	4.46	4.38

A Sun-Dial for the Latitude of 39 Degrees.

North Declination.

22 d. 23 d.	Deg. 0	d. 2	5	d. 7	d. 10	d. 12	d. 15	d. 17	d. 20	d. 22	d. 23	d.
30	Min.		30m		30m		30m		30m		30m	
h m h	Point.	h m h	h m h	h m h	h m h	h m h	h m h	h m h	h m h	h m h	h m h	
12	outh	12	12	12	12	12	12	12	12	12	12	12
0.13	by w	0.29	0.27	0.25	0.24	0.22	0.21	0.19	0.17	0.16	0.14	0.13
0.28	s w	0.58	0.55	0.52	0.49	0.46	0.43	0.39	0.36	0.32	0.30	0.27
0.44	vby s	1.31	1.26	1.22	1.17	1.12	1.07	1.02	0.57	0.51	0.47	0.43
1.04	s w	2.09	2.02	1.55	1.49	1.42	1.35	1.28	1.21	1.13	1.07	1.02
2.25	by w	2.53	2.45	2.36	2.27	2.19	2.10	2.01	1.51	1.41	1.33	1.27
2.03	s w	3.47	3.36	3.26	3.15	3.05	2.54	2.42	2.31	2.18	2.08	2.00
2.50	by s	4.50	4.38	4.26	4.14	4.02	3.49	3.36	3.23	3.08	2.56	2.47
3.55	West.	6.00	5.48	5.35	5.22	5.10	4.56	4.43	4.28	4.13	4.00	3.50
5.14	by n					6.22	6.10	5.57	5.43	5.29	5.16	5.07
6.34	n w									6.45	6.35	6.27
7.14	set.	6.00	6.08	6.16	6.24	6.33	6.41	6.50	6.59	7.09	7.16	7.22
d m d	a's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
28.23	mp.	0.00	3.13	6.26	9.40	12.55	16.10	19.27	22.45	16.7	28.40	20.53

South Declination.

g.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
n.		30m		30m		30m		30m			30m
h m	int.	h.m.	h.m.	h.m.	h m	h m	h m	h m	h m	h m	h m
12	uth	12	12	12	12	12	12	12	12	12	12
10.42	w	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.40	0.41	0.43
4.1.27	w	0.58	1.02	1.05	1.08	1.11	1.14	1.18	1.21	1.25	1.27
0.2.15	vby s	1.31	1.36	1.41	1.46	1.51	1.56	2.01	2.06	2.11	2.16
3.3.09	w	2.01	2.15	2.22	2.29	2.35	2.42	2.49	2.57	3.04	3.10
4.4.13	w	2.53	3.02	3.10	3.19	3.27	3.36	3.46	3.55	4.05	4.13
	w	3.47	3.57	4.08	4.18	4.29	4.39	4.51	5.03		
	ys	4.50	5.02	5.14	5.26						
	it.	6.00									
4.4.46	set.	6.00	5.52	5.44	5.36	5.27	5.19	5.10	5.01	4.51	4.44

A Sun-Dial for the Latitude of 40 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.29	0.28	0.26	0.24	0.23	0.21	0.20	0.18	0.17	0.15	0.14
s s w	1.00	0.57	0.53	0.50	0.47	0.44	0.41	0.37	0.34	0.31	0.29
sw by s	1.33	1.28	1.25	1.19	1.14	1.09	1.04	0.59	0.54	0.49	0.46
s w	2.11	2.04	1.58	1.51	1.45	1.38	1.31	1.24	1.17	1.11	1.06
sw by w	2.56	2.47	2.39	2.30	2.22	2.14	2.04	1.55	1.46	1.38	1.31
w s w	3.49	3.39	3.29	3.18	3.08	2.58	2.47	2.35	2.22	2.13	2.06
w by s	4.51	4.40	4.28	4.17	4.05	3.53	3.40	3.27	3.13	2.02	2.52
West.	6.00	5.48	5.36	5.23	5.11	4.59	4.46	4.32	4.17	3.05	3.55
w by n					6.22	6.11	5.58	5.45	5.31	5.19	5.10
w n w								6.58	6.46	6.36	6.26
☉ let.	6.00	6.08	6.17	6.25	6.34	6.43	6.52	7.01	7.12	7.19	7.26
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.14	6.32	9.48	13.6	16.24	19.45	2.36	26.31	29.26	31.4

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.29	0.31	0.32	0.34	0.34	0.37	0.38	0.40	0.42	0.43	0.44
s s w	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.22	1.25	1.28	1.3
sw by s	1.33	1.38	1.43	1.47	1.52	1.57	2.02	2.07	2.12	2.12	2.2
s w	2.11	2.17	2.24	2.31	2.37	2.44	2.51	2.58	3.05	3.05	3.1
sw by w	2.56	3.04	3.12	3.21	3.29	3.38	3.47	3.56	4.06	4.41	4.5
w s w	3.49	3.59	4.09	4.19	4.30	4.40	4.51				
w by s	4.51	5.03	5.14	5.26							
West.	6.00										
☉ let.	6.00	5.52	5.43	5.35	5.26	5.17	5.08	4.59	4.49	4.41	4.3

A Sun-Dial for the Latitude of 41 Degrees.

North Declination.

Deg.	0	d2	d5	d7	d10	d12	d15	d17	d20	d22	d23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
by w	0.30	0.28	0.27	0.25	0.24	0.22	0.21	0.19	0.17	0.16	0.15	
s s w	1.01	0.58	0.55	0.52	0.49	0.46	0.42	0.39	0.36	0.33	0.31	
sw by s	1.35	1.30	1.25	1.21	1.16	1.11	1.06	1.01	0.56	0.52	0.48	
s w	2.13	2.07	2.00	1.54	1.48	1.41	1.34	1.27	1.20	1.14	1.09	
sw by w	2.58	2.50	2.42	2.33	2.25	2.17	2.08	1.59	1.50	1.42	1.36	
w s w	3.51	3.41	3.31	3.21	3.11	3.01	2.50	2.39	2.28	2.18	2.11	
w by s	4.53	4.42	4.30	4.19	4.08	3.57	3.44	3.31	3.18	3.07	2.58	
West.	6.00	5.48	5.35	5.25	5.13	5.01	4.48	4.35	4.21	4.09	4.00	
w by n					6.23	6.12	5.59	5.46	5.33	5.22	5.13	
w n w									6.46	6.37	6.29	
Of set	6.00	6.09	6.17	6.26	6.35	6.44	6.54	7.04	7.14	7.22	7.29	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	3.18	6.38	9.57	13.18	16.40	20.42	22.29	26.57	29.46	31.54	

South Declination.

Deg.	0	d2	d5	d7	d10	d12	d15	d17	d20	d22	d23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
outh	12	12	12	12	12	12	12	12	12	12	12	
by w	0.39	0.31	0.33	0.34	0.36	0.37	0.39	0.40	0.42	0.44	0.45	
s s w	1.01	1.04	1.07	1.10	1.13	1.16	1.19	1.23	1.26	1.29	1.31	
sw by s	1.35	1.39	1.44	1.49	1.53	1.58	2.03	2.08	2.13	2.18	2.21	
s w	2.13	2.19	2.26	2.32	2.39	2.45	2.52	2.59	3.06	3.12	3.17	
sw by w	2.58	3.06	3.14	3.22	3.31	3.39	3.48	3.57	4.06	4.14	4.20	
w s w	3.51	4.01	4.11	4.21	4.30	4.40	4.51	5.02				
w by s	4.53	5.04	5.15	5.26								
West.	6.00											
Of set	6.00	5.51	5.43	5.34	5.25	5.16	5.06	4.56	4.46	4.38	4.31	

E

*A Sun-Dial for the Latitude of 42 Degrees.***North Declination.**

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.18	0.17	0.16	
s s w	1.02	0.59	0.56	0.53	0.50	0.47	0.44	0.41	0.37	0.34	0.33	
s w by s	1.36	1.32	1.27	1.23	1.18	1.14	1.09	1.04	0.58	0.55	0.51	
s w	2.15	2.09	2.03	1.56	1.50	1.44	1.37	1.30	1.23	1.17	1.13	
sw by w	3.00	2.52	2.44	2.36	2.28	2.20	2.12	2.03	1.54	1.46	1.40	
w s w	3.53	3.43	3.34	3.24	3.15	3.05	2.54	2.44	2.33	2.23	2.16	
w by s	4.54	4.43	4.32	4.21	4.10	4.00	3.47	3.36	3.23	3.12	3.03	
West	6.00	5.49	5.37	5.26	5.15	5.03	4.51	4.39	4.25	4.11	4.04	
w by r					6.23	6.12	6.00	5.49	5.35	5.24	5.16	
w n w								6.58	6.47	6.37	6.30	
☉ set	6.00	6.09	5.18	6.27	6.37	6.46	6.56	7.06	7.17	7.25	7.32	
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	
Amp.	0.00	3.21	6.44	10.6	13.31	16.57	20.23	23.52	27.24	30.16	32.27	

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
s by w	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.41	0.43	0.44	0.45	
s s w	1.02	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.27	1.30	1.32	
sw by s	1.36	1.41	1.46	1.50	1.55	1.59	2.04	2.09	2.14	2.19	2.22	
s w	2.15	2.21	2.28	2.34	2.40	2.46	2.53	3.00	3.07	3.13	3.17	
sw by w	3.00	3.08	3.16	3.24	3.32	3.40	3.49	3.57	4.07	4.14	4.21	
w s w	3.53	4.02	4.12	4.22	4.31	4.41	4.52					
w by s	4.15	5.04	5.15	5.26								
West	6.00											
☉ set	6.00	5.51	5.42	5.33	5.23	5.14	5.04	4.54	4.43	4.35	4.28	

A Sun-Dial for the Latitude of 43 Degrees.

North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.31	0.29	0.28	0.27	0.25	0.24	0.22	0.21	0.19	0.18	0.17
s w	1.03	1.00	0.97	0.94	0.91	0.88	0.85	0.82	0.79	0.76	0.74
w by s	1.38	1.34	1.29	1.24	1.20	1.15	1.11	1.06	1.01	0.97	0.93
s w	2.17	2.11	2.05	1.99	1.93	1.87	1.80	1.73	1.66	1.60	1.56
w by w	3.02	2.55	2.47	2.39	2.31	2.23	2.15	2.07	1.98	1.90	1.84
s w	3.55	3.46	3.36	3.27	3.18	3.08	2.98	2.88	2.77	2.68	2.61
by s	4.55	4.45	4.34	4.23	4.13	4.03	3.91	3.80	3.67	3.57	3.49
West.	6.00	4.49	5.38	5.27	5.16	5.05	4.53	4.41	4.27	4.17	4.10
by n					6.23	6.13	6.01	5.50	5.37	5.27	5.19
n w								5.58	6.47	6.38	6.31
et.	6.00	6.09	6.19	6.28	6.38	6.48	6.58	7.09	7.19	7.28	7.36
an's d.	md	md	md	md	md	md	md	md	md	md	md
mp.	0.00	3.25	6.51	10.70	13.44	17.12	20.43	24.16	27.53	30.48	33.32

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.31	0.32	0.34	0.35	0.37	0.38	0.40	0.41	0.43	0.44	0.45
s w	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.32
w by s	1.38	1.42	1.47	1.52	1.56	2.01	2.05	2.10	2.15	2.19	2.23
s w	2.17	2.23	2.29	2.36	2.42	2.48	2.54	3.01	3.08	3.14	3.18
w by w	3.02	3.10	3.18	3.26	3.33	3.41	3.50	3.58	4.07	4.14	4.20
s w	3.55	4.04	4.14	4.23	4.32	4.42	4.52				
by s	4.55	5.05	5.16	5.27							
West.	6.00										
et.	6.00	5.51	5.41	5.32	5.22	5.12	5.02	4.51	4.41	4.32	4.24

A Sun-Dial for the Latitude of 44 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.18	0.17
s sw	1.04	1.01	0.98	0.96	0.93	0.90	0.87	0.84	0.80	0.78	0.76
sw by s	1.40	1.35	1.31	1.27	1.22	1.18	1.13	1.08	1.03	0.99	0.96
s w	2.19	2.13	2.07	2.01	1.95	1.89	1.83	1.76	1.69	1.64	1.58
sw by w	3.04	2.97	2.90	2.82	2.74	2.66	2.58	2.50	2.41	2.34	2.26
w sw	3.57	3.48	3.38	3.29	3.21	3.12	3.02	2.92	2.81	2.73	2.66
w by s	4.56	4.46	4.36	4.25	4.16	4.05	3.94	3.83	3.71	3.61	3.51
West.	6.00	5.50	5.39	5.28	5.18	5.07	4.96	4.84	4.71	4.59	4.48
w by w					6.23	6.13	6.02	5.91	5.79	5.67	5.56
w n w								6.59	6.48	6.39	6.31
☉ set	6.00	6.10	6.19	6.29	6.39	6.49	7.00	7.11	7.22	7.31	7.39
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.28	6.58	10.27	13.58	17.30	21.5	24.42	28.23	31.23	33.4

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.33	0.34	0.36	0.37	0.38	0.40	0.42	0.43	0.45	0.46
s sw	1.04	1.07	1.10	1.13	1.16	1.19	1.22	1.25	1.28	1.31	1.33
sw by s	1.40	1.44	1.48	1.53	1.57	2.02	2.06	2.11	2.16	2.20	2.23
s w	2.19	2.25	2.31	2.37	2.43	2.49	2.56	3.02	3.09	3.14	3.19
sw by w	3.04	3.12	3.19	3.27	3.35	3.42	3.51	3.59	4.08	4.15	4.20
w sw	3.57	4.06	4.15	4.24	4.33	4.42	4.52				
w by s	4.56	5.06	5.16	5.27							
West.	6.00										
☉ set	6.07	5.57	5.41	5.31	5.21	5.11	5.00	4.49	4.38	4.29	4.20

A Sun-Dial for the Latitude of 45 Degrees.

North Declination.

Deg. Min.	0	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.32	0.31	0.29	0.28	0.26	0.25	0.24	0.22	0.20	0.19	0.18
ss w	1.05	1.03	1.00	0.97	0.94	0.91	0.88	0.85	0.82	0.79	0.77
sw by s	1.41	1.37	1.33	1.28	1.24	1.19	1.15	1.10	1.05	1.01	0.98
s w	2.21	2.15	2.09	2.03	1.98	1.92	1.85	1.79	1.73	1.67	1.62
swb w	3.06	2.59	2.52	2.45	2.37	2.29	2.22	2.13	2.05	1.98	1.93
w s w	3.59	3.50	3.41	3.32	3.23	3.14	3.05	2.95	2.85	2.77	2.70
w by s	4.57	4.47	4.38	4.28	4.18	4.08	3.97	3.86	3.75	3.66	3.58
West.	6.00	5.50	5.40	5.30	5.19	5.09	4.98	4.86	4.75	4.65	4.57
w by n					6.24	6.14	6.03	5.92	5.81	5.71	5.62
wn w								6.58	6.48	6.40	6.33
wnb w											7.40
☉ set.	6.00	6.10	6.20	6.30	6.41	6.51	7.02	7.13	7.25	7.35	7.43
☉ s	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Amp.	0.00	3.32	07.50	10.38	14.13	17.49	21.28	25.51	28.56	32.03	34.20

South Declination.

Deg. Min.	0	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.32	0.33	0.35	0.36	0.38	0.39	0.41	0.42	0.44	0.45	0.46
ss w	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.31	1.33
sw by s	1.41	1.45	1.50	1.54	1.58	2.03	2.07	2.12	2.17	2.21	2.24
s w	2.21	2.27	2.33	2.39	2.44	2.51	2.57	3.03	3.10	3.15	3.19
swb n	3.06	3.14	3.21	3.28	3.36	3.44	3.51	4.00	4.08	4.15	
w s w	3.59	4.07	4.16	4.25	4.34	4.43	4.52				
w by s	4.57	5.07	5.17	5.26							
West.	5.00										
☉ set.	5.00	5.50	5.40	5.30	5.19	5.09	4.58	4.47	4.35	4.25	4.17

*The Mariners Compass Rectified.**A Sun Dial for the Latitude of 46 Degrees.*

North Declination

Deg. Min.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.31	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.19
s s w	1.06	1.04	1.01	0.98	0.95	0.92	0.89	0.86	0.83	0.81	0.79
sw by s	1.43	1.38	1.34	1.30	1.26	1.21	1.17	1.12	1.08	1.04	1.01
s w	2.23	2.17	2.11	2.06	2.00	1.94	1.88	1.82	1.76	1.70	1.64
sw by w	3.08	3.01	2.94	2.87	2.80	2.72	2.65	2.57	2.50	2.42	2.35
w s w	4.00	3.52	3.43	3.35	3.26	3.17	3.08	2.99	2.89	2.81	2.73
w by s	5.58	5.49	5.39	5.30	5.20	5.11	5.00	4.90	4.80	4.70	4.60
West.	6.00	5.50	5.40	5.30	5.20	5.11	5.00	4.90	4.80	4.70	4.60
w by n					6.24	6.14	6.04	5.54	5.43	5.33	5.23
w n w								6.59	6.49	6.39	6.29
n w by w											7.40
☉ set	6.00	6.10	6.21	6.31	6.42	6.53	7.04	7.16	7.29	7.3	7.47
Sun's Amp.	0.0	2.26	7.17	10.50	14.27	18.0	21.53	25.29	29.20	32.27	35.5

South Declination.

Deg. Min.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.34	0.35	0.37	0.38	0.40	0.41	0.42	0.44	0.45	0.46
s s w	1.06	1.09	1.12	1.15	1.18	1.20	1.23	1.26	1.29	1.32	1.34
sw by s	1.44	1.47	1.51	1.55	2.00	2.04	2.08	2.13	2.18	2.22	2.26
s w	2.23	2.29	2.34	2.40	2.46	2.52	2.58	3.04	3.10	3.16	3.22
sw by w	3.08	3.16	3.23	3.30	3.37	3.45	3.52	4.00	4.08	4.15	
w s w	4.00	4.09	4.17	4.26	4.34	4.43					
w by s	4.58	5.08	5.17	5.26							
West.	6.00										
☉ set	6.00	5.52	5.35	5.29	5.18	5.07	4.56	4.44	4.31	4.21	4.10

The Mariners Compass Rectified;

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Sun-Dial for the Latitude of 47 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 25
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	3.33	0.32	0.30	0.29	0.28	0.26	0.25	0.23	0.22	0.21	0.20
ss w	1.07	1.05	1.02	0.99	0.96	0.94	0.91	0.88	0.85	0.82	0.80
sw by s	1.44	1.34	1.36	1.32	1.28	1.23	1.19	1.15	1.10	1.06	1.00
s w	2.25	2.19	2.14	2.08	2.02	1.57	1.51	1.45	1.39	1.33	1.25
sw by w	3.10	3.03	2.56	2.49	2.41	2.35	2.28	2.20	2.14	2.06	2.01
w s w	4.02	3.54	3.46	3.37	3.29	3.20	3.12	3.03	2.53	2.45	2.35
w by s	4.59	4.50	4.41	4.32	4.23	4.13	4.03	3.53	3.43	3.34	3.27
West	5.00	5.51	5.41	5.32	5.22	5.12	5.03	4.52	4.41	4.31	4.24
w by n				6.34	6.25	5.15	6.05	5.55	5.44	5.36	5.29
w n w							7.08	6.59	6.49	6.42	6.35
nw by w											7.40
☉ set	6.00	6.11	6.22	6.33	6.44	6.55	7.07	7.20	7.32	7.43	7.51
☽ sets	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.40	7.21	11.2	14.45	18.30	22.18	26.10	30.7	33.19	35.48

South Declination.

Deg.	1	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 25
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.33	0.34	0.35	0.37	0.38	0.40	0.41	0.43	0.44	0.45	0.46
ss w	1.02	1.10	1.13	1.16	1.18	1.21	1.24	1.27	1.30	1.32	1.34
w by s	1.44	1.48	1.52	1.57	2.01	2.05	2.09	2.14	2.18	2.22	2.25
s w	2.25	2.30	2.36	2.41	2.47	2.53	2.59	3.05	3.11	3.16	3.20
sw by w	3.10	3.17	3.24	3.31	3.38	3.45	3.53	4.00	4.07	4.15	
w s w	4.02	4.10	4.18	4.26	4.35	4.43					
w by s	4.59	5.08	5.17								
West.	6.00										
☉ set	6.00	5.49	5.38	5.27	5.16	5.05	4.53	4.40	4.28	4.17	4.06

*A Sun Dial for the Latitude of 48 Degrees.***North Declination.**

Deg. Min.	0 d.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.34	0.32	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.22	0.21
s s w	1.08	1.06	1.03	1.00	0.58	0.55	0.52	0.49	0.46	0.44	0.42
sw by s	1.46	1.42	1.38	1.34	1.30	1.25	1.21	1.17	1.12	1.08	1.05
s w	2.26	2.21	2.16	2.10	2.05	1.59	1.53	1.47	1.41	1.36	1.32
sw by w	3.12	3.05	2.59	2.52	2.45	2.39	2.31	2.23	2.16	2.09	2.04
w s w	4.03	4.56	3.48	3.40	3.32	3.23	3.15	3.06	2.57	2.49	2.43
w by s	5.09	5.51	4.43	4.34	4.25	4.16	4.06	3.56	3.46	3.38	3.31
West.	6.00	6.51	5.42	5.33	5.23	5.14	5.04	4.54	4.43	4.35	4.28
w by n					6.25	6.16	6.06	5.56	5.46	5.38	5.31
w n w							7.08	6.59	6.50	6.42	6.36
n w by w										7.45	7.40
☉ let	6.00	6.11	6.22	6.33	6.45	6.57	7.09	7.22	7.35	7.47	7.56
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.49	7.29	11.15	15.2	18.52	22.45	26.43	30.45	34.3	36.34

South Declination.

Deg. Min.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.34	0.35	0.36	0.38	0.39	0.40	0.42	0.43	0.45	0.47	0.47
s s w	1.08	1.11	1.14	1.16	1.19	1.22	1.25	1.28	1.31	1.33	1.35
sw by s	1.46	1.50	1.54	1.58	2.02	2.06	2.10	2.15	2.19	2.23	2.26
s w	2.26	2.32	2.37	2.43	2.48	2.54	3.00	3.05	3.12	3.17	3.21
sw by w	3.12	3.19	3.26	3.32	3.39	3.45	3.53	4.01	4.09		
w s w	4.03	4.11	4.19	4.27	4.35	4.44					
w by s	5.00	5.09	5.17	5.26							
West.	6.00										
☉ let	6.00	5.49	5.38	5.27	5.15	5.03	4.51	4.38	4.25	4.13	4.04

A Sun-Dial for the Latitude of 49 Degrees.

North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.34	0.33	0.32	0.30	0.29	0.28	0.26	0.25	0.23	0.22	0.21
s w	1.09	1.07	1.04	1.02	0.99	0.96	0.93	0.91	0.88	0.85	0.83
w by s	1.47	1.43	1.39	1.35	1.31	1.27	1.23	1.19	1.14	1.11	1.08
s w	2.28	2.23	2.18	2.12	2.07	2.01	1.96	1.90	1.84	1.79	1.75
w by w	3.14	3.07	3.01	2.94	2.88	2.81	2.74	2.67	2.59	2.53	2.48
s w	4.05	3.97	3.90	3.82	3.74	3.66	3.58	3.50	3.41	3.34	3.28
w by s	5.01	4.93	4.84	4.76	4.67	4.58	4.49	4.40	4.31	4.22	4.14
West.	6.00	5.51	5.42	5.34	5.25	5.16	5.06	4.96	4.86	4.76	4.67
w by n				6.34	6.25	6.16	6.07	5.98	5.88	5.78	5.68
n w							7.08	7.00	6.51	6.43	6.34
w by w										7.45	7.40
© set	6.00	6.11	6.23	6.35	6.47	6.59	7.12	7.25	7.39	7.51	8.00
sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
amp.	0.00	3.48	7.28	11.28	15.21	19.15	23.14	27.17	31.25	34.48	37.26

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.34	0.35	0.37	0.38	0.39	0.41	0.42	0.43	0.45	0.46	0.47
s w	1.09	1.12	1.15	1.17	1.20	1.23	1.25	1.28	1.31	1.33	1.35
w by s	1.47	1.51	1.55	1.59	2.03	2.07	2.11	2.15	2.20	2.23	2.26
s w	2.28	2.33	2.39	2.44	2.49	2.55	3.00	3.06	3.12	3.17	3.21
w by w	3.14	3.20	3.27	3.34	3.40	3.47	3.54	4.01	4.09		
s w	4.05	4.13	4.20	4.28	4.36	4.44					
w by s	5.01	5.09	5.18								
West.	6.00										
© set	6.00	5.49	5.37	5.25	5.13	5.01	4.48	4.35	4.21	4.09	4.0

The Mariners Compass Rectified
A Sun-Dial for the Latitude of 50 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.33	0.32	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.22
s s w	1.10	1.08	1.05	1.03	1.00	0.58	0.55	0.52	0.49	0.47	0.45
sw by s	1.48	1.45	1.41	1.37	1.33	1.29	1.25	1.21	1.16	1.13	1.10
s w	2.30	2.25	2.20	2.15	2.09	2.04	1.58	1.53	1.47	1.42	1.38
sw by w	3.16	3.09	3.03	2.56	2.50	2.43	2.36	2.30	2.23	2.16	2.12
w s w	4.06	3.59	3.51	3.44	3.36	3.29	3.21	3.13	3.04	2.57	2.51
w by s	5.02	4.54	4.45	4.37	4.29	4.20	4.12	4.03	3.53	3.45	3.39
West	6.00	5.52	5.43	5.34	5.26	5.17	5.08	4.59	4.49	4.41	4.34
w by n				6.34	6.25	6.17	6.08	5.59	5.49	5.42	5.36
w n w							7.08	7.00	6.51	6.44	6.39
n w by w										7.45	7.41
☉ let.	6.00	6.12	6.24	6.36	6.49	7.01	7.14	7.28	7.43	7.55	8.05
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amn.	5.00	5.25	5.48	5.74	6.01	6.29	6.58	7.27	7.53	8.20	8.40

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.36	0.37	0.38	0.40	0.41	0.42	0.44	0.45	0.46	0.47
s s w	1.10	1.13	1.15	1.18	1.21	1.23	1.26	1.29	1.32	1.34	1.36
sw by s	1.48	1.52	1.56	2.00	2.04	2.08	2.12	2.16	2.20	2.24	2.27
s w	2.30	2.35	2.40	2.45	2.50	2.56	3.01	3.07	3.13	3.17	3.21
sw by w	3.16	3.22	3.28	3.35	3.41	3.48	3.55	4.02	4.09		
w s w	4.06	4.14	4.21	4.29	4.36	4.44					
w by s	5.02	5.10	5.18								
West	6.00										
☉ let.	5.00	5.48	5.36	5.24	5.11	4.59	4.46	4.32	4.17	3.05	3.55

A Sun-Dial for the Latitude of 51 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.26	0.25	0.24	0.23
s s w	1.11	1.09	1.06	1.04	1.0	0.59	0.56	0.53	0.51	0.48	0.47
sw by s	1.50	1.46	1.42	1.39	1.35	1.31	1.27	1.23	1.19	1.15	1.12
s w	2.31	2.26	2.21	2.16	2.11	2.06	2.01	1.55	1.50	1.45	1.41
sw by w	3.17	3.11	3.05	2.59	2.52	2.45	2.39	2.33	2.26	2.20	2.15
w s w	4.08	4.01	3.53	3.46	3.39	3.31	3.24	3.16	3.07	3.01	2.55
w by s	5.03	4.55	4.47	4.39	4.31	4.22	4.14	4.05	3.56	3.49	3.43
West.	6.00	5.52	5.44	5.35	5.27	5.18	5.10	5.01	4.51	4.44	4.37
w by n				6.34	6.25	6.17	6.09	6.00	5.51	5.44	5.38
w n w							7.00	7.00	6.52	6.45	6.40
n w by w										7.45	7.41
☉ set	6.00	6.12	6.25	6.38	6.50	7.03	7.17	7.32	7.47	8.00	8.10
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	3.58	7.58	11.58	16.1	20.5	24.17	28.33	32.55	36.32	39.20

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.36	0.38	0.39	0.40	0.41	0.43	0.44	0.46	0.47	0.48
s s w	1.11	1.14	1.16	1.19	1.2	1.24	1.27	1.29	1.32	1.34	1.36
sw by s	1.50	1.53	1.57	2.01	2.05	2.09	2.13	2.17	2.21	2.24	2.27
s w	2.31	2.36	2.41	2.46	2.52	2.57	3.02	3.07	3.13	3.18	3.21
sw by w	3.17	3.23	3.30	3.39	3.42	3.49	3.55	4.02	4.09		
w s w	4.08	4.15	4.22	4.26	4.37	4.44					
w by s	5.03	5.10	5.18								
West.	6.00										
☉ set.	6.00	5.47	5.35	5.22	5.10	4.57	4.43	4.28	4.13	4.00	3.50

A Sun Dial for the Latitude of 52 Degrees.

North Declination.

Deg. Min.	d	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Points	h	m	h	m	h	m	h	m	h	m	m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0.34	0.33	0.32	0.31	0.30	0.28	0.27	0.26	0.27	0.24
s s w	1.12	1.10	1.08	1.05	1.03	1.00	0.57	0.55	0.52	0.50	0.48
sw by s	1.51	1.47	1.44	1.42	1.36	1.33	1.29	1.25	1.21	1.17	1.15
s w	2.33	2.28	2.23	2.18	2.13	2.08	2.03	1.58	1.52	1.48	1.44
s w b w	3.19	3.13	3.07	3.01	2.55	2.48	2.42	2.36	2.29	2.24	2.19
w s w	4.09	4.02	3.55	3.48	3.41	3.34	3.26	3.19	3.11	3.04	2.59
w by s	5.03	4.56	4.48	4.40	4.33	4.25	4.16	4.08	3.59	3.52	3.46
West	6.00	5.52	5.44	5.36	5.28	5.20	5.12	5.03	4.54	4.46	4.40
w by n				6.33	6.26	6.18	6.10	6.01	5.53	5.45	5.40
w n w							7.08	7.00	6.53	6.46	6.41
n w b w										7.45	7.40
☉ lev	6.00	6.13	6.26	6.39	6.52	7.06	7.2	7.35	7.51	8.05	8.16
Sun s	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp	0.00	4.03	8.08	12.14	16.23	20.40	24.51	29.14	33.46	37.29	40.21

South Declination.

Deg. Min.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Points	h	m	h	m	h	m	h	m	h	m	m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0.37	0.36	0.39	0.41	0.42	0.43	0.44	0.46	0.47	0.48
s s w	1.12	1.15	1.17	1.20	1.22	1.25	1.27	1.30	1.33	1.35	1.37
sw by s	1.51	1.55	1.58	2.02	2.06	2.10	2.13	2.17	2.22	2.25	2.28
s w	2.33	2.38	2.43	2.48	2.53	2.58	3.03	3.08	3.13	3.18	3.22
s w b w	3.19	3.25	3.33	3.37	3.43	3.49	3.56	4.02	4.10		
w s w	4.09	4.16	4.23	4.30	4.37	4.44					
w by s	5.03	5.11	5.19								
West	6.00										
☉ lev	6.00	6.47	5.34	5.21	5.08	4.54	4.40	4.25	4.09	3.55	3.41

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Sun-Dial for the Latitude of 53 Degrees.

North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d	
Min.	30m		30m		30m		30m		30m		30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	12
by w	0.36	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.26	0.25	0.24	0.24
ss w	1.13	1.11	1.08	1.06	1.04	1.01	0.99	0.96	0.93	0.91	0.90	0.90
sw by s	1.52	1.49	1.45	1.41	1.38	1.34	1.31	1.27	1.23	1.19	1.17	1.17
s w	2.34	2.30	2.25	2.20	2.15	2.10	2.05	2.00	1.95	1.91	1.87	1.87
swb w	3.20	3.15	3.09	3.03	2.97	2.91	2.85	2.78	2.72	2.66	2.62	2.62
w s w	4.10	4.04	3.97	3.90	3.83	3.76	3.69	3.62	3.54	3.48	3.43	3.43
w by s	5.04	4.57	4.49	4.42	4.34	4.27	4.19	4.11	4.02	3.95	3.90	3.90
West.	6.00	5.52	5.45	5.37	5.29	5.22	5.15	5.07	4.98	4.91	4.87	4.87
w by n				6.34	6.26	6.19	6.11	6.03	5.94	5.87	5.82	5.82
w n w							7.08	7.01	6.93	6.87	6.82	6.82
nwb w									7.51	7.46	7.43	7.43
☉ set.	6.00	6.14	6.27	6.41	6.54	7.08	7.23	7.39	7.56	8.10	8.21	8.21
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	4.09	8.19	12.31	16.46	21.52	25.28	29.59	34.39	38.31	41.25	41.25

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m		30m		30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.36	0.37	0.38	0.40	0.41	0.42	0.43	0.45	0.46	0.47	0.48
s w	1.13	1.16	1.18	1.20	1.23	1.25	1.28	1.30	1.33	1.35	1.37
w by s	1.52	1.56	2.00	2.03	2.07	2.10	2.14	2.18	2.22	2.25	2.28
s w	2.34	2.39	2.44	2.49	2.54	2.58	3.03	3.09	3.14	3.18	3.22
sw by w	3.20	3.26	3.32	3.38	3.44	3.50	3.56	4.02			
w s w	4.10	4.17	4.24	4.30	4.37	4.44					
w b s	5.04	5.11	5.19								
West.	6.00										
☉ set	6.00	5.46	5.33	5.19	5.06	4.52	4.37	4.21	4.04	3.50	3.35

A Sun-Dial for the Latitude of 54 Degrees.

North Declination.

Deg. Min.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Points	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.35	0.34	0.33	0.32	0.31	0.29	0.28	0.27	0.26	0.25
s s w	1.14	1.1	1.09	1.07	1.05	1.02	1.00	0.97	0.95	0.93	0.91
sw by s	1.54	1.5	1.47	1.43	1.40	1.36	1.32	1.29	1.25	1.22	1.19
s w	2.36	2.31	2.27	2.22	2.17	2.12	2.08	2.03	1.97	1.93	1.90
s w b w	3.22	3.16	3.11	3.05	2.99	2.93	2.87	2.81	2.75	2.69	2.65
w s w	4.12	4.05	3.99	3.92	3.85	3.79	3.72	3.65	3.58	3.51	3.45
w by s	5.05	4.55	4.51	4.43	4.36	4.29	4.21	4.13	4.05	3.98	3.93
West.	6.00	5.52	5.45	5.38	5.31	5.23	5.15	5.07	4.99	4.92	4.86
w by n				6.34	6.27	6.19	6.12	6.04	5.96	5.89	5.84
w n w							7.09	7.01	6.54	6.48	6.43
n w b w									7.51	7.46	7.42
☉ set	5.00	6.14	5.28	6.42	6.56	7.11	7.27	7.43	8.00	8.15	8.27
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp	0.00	4.12	3.32	2.49	1.71	2.36	2.67	3.04	3.55	3.97	4.43

South Declination.

Deg. Min.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Points	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.38	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.47	0.48
s s w	1.14	1.16	1.19	1.21	1.24	1.26	1.28	1.31	1.33	1.35	1.37
sw by s	1.54	1.57	2.01	2.04	2.08	2.11	2.15	2.19	2.23	2.26	2.28
s w	2.36	2.41	2.45	2.50	2.54	2.59	3.04	3.06	3.15	3.19	3.22
sw b w	3.22	3.27	3.33	3.39	3.44	3.50	3.56	4.03			
w s w	4.12	4.18	4.24	4.31	4.38	4.45					
w by s	5.05	5.12	5.19								
West	6.00										
☉ set	6.00	5.46	5.32	5.18	5.04	4.49	4.33	4.17	4.00	3.45	3.33

A Sun-Dial for the Latitude of 55 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.37	0.36	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.27	0.26
s w	1.15	1.13	1.10	1.08	1.06	1.03	1.01	0.99	0.96	0.94	0.92
why s	1.55	1.51	1.48	1.45	1.41	1.38	1.34	1.30	1.27	1.23	1.21
s w	2.37	2.33	2.28	2.24	2.19	2.14	2.10	2.05	2.00	1.55	1.52
why w	3.23	3.18	3.12	3.07	3.01	2.56	2.50	2.44	2.38	2.33	2.29
s w	4.13	4.06	4.00	3.54	3.47	3.41	3.34	3.27	3.20	3.14	3.10
by s	5.06	4.59	4.52	4.45	4.38	4.31	4.23	4.16	4.08	4.02	3.56
West.	6.00	5.53	5.45	5.39	5.32	5.24	5.17	5.09	5.01	4.54	4.49
by n					6.27	6.20	6.13	6.05	5.57	5.51	5.46
n iv							7.09	7.02	6.55	6.49	6.44
why w									7.51	7.46	7.42
set.	6.00	6.14	6.29	6.43	6.58	7.14	7.30	7.47	8.05	8.21	8.34
un's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
mp.	0.00	4.21	8.45	13.09	17.37	22.10	26.49	31.42	36.36	40.46	44.2

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m			30m
Point.	h.m.	h.m.	h.m.	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
y w	0.37	0.38	0.39	0.40	0.42	0.43	0.44	0.45	0.46	0.47	0.48
s w	1.15	1.17	1.20	1.22	1.24	1.26	1.29	1.31	1.34	1.36	1.38
by s	1.55	1.58	2.01	2.05	2.08	2.12	2.16	2.19	2.23	2.26	2.29
w	2.37	2.42	2.46	2.51	2.55	3.00	3.05	3.10	3.15	3.19	3.22
b w	3.23	3.29	3.34	3.40	3.45	3.51	3.57	4.03			
s w	4.13	4.19	4.25	4.32	4.38	4.45					
by s	5.06	5.12	5.19								
est.	6.00										
set.	5.00	5.46	5.31	5.17	5.02	4.46	4.30	4.13	3.55	3.29	3.26

A Sun-Dial for the Latitude of 56 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.28	0.27	0.26
s s w	1.16	1.14	1.11	1.09	1.07	1.05	1.02	1.00	0.57	0.55	0.53
sw by s	1.56	1.53	1.49	1.46	1.43	1.39	1.26	1.32	1.28	1.26	1.23
s w	2.39	2.34	2.30	2.26	2.21	2.16	2.12	2.07	2.02	1.59	1.55
sw by w	3.25	3.19	3.14	3.09	3.03	2.58	2.52	2.46	2.40	2.36	2.32
w s w	4.14	4.08	4.02	3.56	3.50	3.43	3.37	3.30	3.23	3.17	3.13
w by s	5.06	5.00	4.53	4.46	4.40	4.33	4.26	4.14	4.11	4.05	4.00
West	6.00	5.53	5.46	5.39	5.32	5.26	5.18	5.11	5.03	4.57	4.52
w by n				6.34	6.28	6.21	6.14	6.06	6.59	5.53	5.48
w n w						7.15	7.09	7.02	6.55	6.50	6.45
n w by w								7.51	7.46	7.43	
☉ let.	6.00	6.15	6.30	6.45	7.00	7.16	7.34	7.52	8.10	8.27	8.41
Sun's Amp.	0.00	4.28	8.58	13.39	18.6	22.46	27.34	32.34	37.42	42.4	45.6

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.47	0.48	0.48
s s w	1.16	1.18	1.20	1.22	1.25	1.27	1.29	1.32	1.34	1.36	1.38
sw by s	1.56	1.59	2.02	2.06	2.09	2.13	2.16	2.20	2.24	2.26	2.30
s w	2.39	2.43	2.47	2.52	2.57	3.01	3.06	3.10	3.15	3.19	
sw by w	3.25	3.30	3.35	3.40	3.46	3.51	3.57	4.03			
w s w	4.14	4.20	4.26	4.32	4.38						
w by s	5.06	5.13	5.19								
West	6.00										
☉ let.	6.00	5.45	5.30	5.15	5.00	4.44	4.26	4.08	3.50	3.33	3.19

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A Sun-Dial for the Latitude of 57 Degrees.

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North Declination.

Deg.	10	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
by w	0.38	0.37	0.36	0.35	0.34	0.32	0.31	0.30	0.29	0.28	0.27	
s w	1.17	1.14	1.12	1.10	1.08	1.06	1.04	1.01	0.99	0.97	0.95	
swbys	1.57	1.54	1.51	1.47	1.44	1.41	1.37	1.34	1.30	1.27	1.25	
s w	2.40	2.36	2.32	2.24	2.23	2.18	2.14	2.10	2.05	2.01	1.58	
swbw	3.22	3.21	3.10	3.11	3.05	3.00	2.55	2.49	2.43	2.38	2.35	
w s w	4.15	4.09	4.03	3.57	3.51	3.45	3.39	3.33	3.26	3.20	3.16	
w by s	5.07	5.00	4.54	4.47	4.41	4.34	4.28	4.2	4.13	4.07	4.03	
West.	5.59	5.53	5.47	5.40	5.33	5.27	5.20	5.13	5.05	4.59	4.54	
v by				6.34	6.28	6.21	6.14	6.07	6.00	5.54	5.50	
w d w						7.15	7.09	7.03	6.56	6.51	6.46	
m d w									7.52	7.47	7.43	
n w											8.30	
☉ ter	5.00	6.16	6.31	6.47	7.0	7.20	7.38	7.55	8.16	8.34	8.48	
Sun's	d.m	d.m	d.m	d.m	d.m	d.m	d.m	d.m	d.m	d.m	d.m	
Amp.	0.0	4.35	5.13	5.52	6.36	7.24	8.12	9.01	9.53	10.43	11.27	12.0

South Declination.

Deg.	10	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23	d
Min.		30m		30m		30m		30m			30m	
Point.	h	m	h	m	h	m	h	m	h	m	h	m
South	12	12	12	12	12	12	12	12	12	12	12	
by w	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.46	0.47	0.48	0.49	
s s w	1.17	1.19	1.21	1.23	1.25	1.27	1.30	1.32	1.38	1.36	1.38	
swbys	1.57	2.00	2.03	2.07	2.10	2.13	2.17	2.20	2.24	2.27	2.29	
s w	2.40	2.44	2.48	2.53	2.57	3.02	3.06	3.10	3.15	3.19		
swb w	3.26	3.31	3.36	3.41	3.46	3.53	3.57	4.03				
w s w	4.15	4.21	4.26	4.32	4.38							
w by s	5.07	5.13	5.19									
West.	6.00											
☉ ter	6.00	6.44	5.29	5.13	4.57	4.40	4.22	4.04	3.44	3.26	3.12	

A Sun-Dial for the Latitude of 58 Degrees.

North Declination.

Deg. Min.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Points	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.38	0.37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.29	0.28
s s w	1.17	1.15	1.13	1.11	1.09	1.07	1.05	1.02	1.00	0.58	0.56
sw by s	1.58	1.55	1.52	1.49	1.46	1.42	1.39	1.35	1.32	1.29	1.26
s w	2.41	2.37	2.33	2.29	2.25	2.2	2.16	2.12	2.07	2.04	2.0
sw b w	3.27	3.22	3.17	3.12	3.07	3.02	2.57	2.51	2.46	2.41	2.36
w s w	4.16	4.10	4.05	3.59	3.53	3.47	3.41	3.35	3.29	3.23	3.17
w by s	5.07	5.01	4.55	4.49	4.43	4.36	4.30	4.23	4.16	4.10	4.04
West.	6.00	5.54	5.47	5.41	5.35	5.28	5.21	5.15	5.08	5.02	4.95
w b n			8.	6.34	6.2	6.22	6.15	6.08	6.02	5.56	5.5
w n w						7.16	7.10	7.03	6.57	6.52	6.46
uw b w								7.57	7.52	7.47	7.4
n w											8.3
☉ set.	6.00	6.16	6.32	6.49	7.06	7.24	7.42	8.01	8.22	8.41	8.5
Sun's	d	md	md	md	md	md	md	md	md	md	md
Amp.	0.00	4.43	9.28	14.16	19.8	24.6	29.14	34.34	40.12	44.59	48.8

South Declination.

Deg. Min.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Points	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.38	0.39	0.40	0.41	0.43	0.44	0.45	0.46	0.47	0.48	0.49
s s w	1.17	1.19	1.22	1.24	1.26	1.28	1.30	1.32	1.35	1.37	1.39
sw by s	1.58	2.01	2.04	2.07	2.10	2.14	2.17	2.21	2.24	2.27	2.30
s w	2.41	2.45	2.49	2.53	2.57	3.02	3.06	3.10	3.15	3.19	3.23
sw b w	3.27	3.32	3.37	3.42	3.47	3.52	3.57				
w s w	4.16	4.21	4.27	4.33	4.38						
w by s	5.07	5.13	5.19								
West.	6.00										
☉ set.	6.00	5.44	5.28	5.11	4.54	4.36	4.18	3.59	3.38	3.19	3.0

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A Sun Dial for the Latitude of 59 Degrees.

North Declination

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.39	0.38	0.37	0.36	0.35	0.34	0.32	0.31	0.30	0.29	0.29
s w	1.18	1.16	1.14	1.12	1.10	1.08	1.06	1.04	1.01	1.00	0.98
sw by s	1.55	1.56	1.53	1.30	1.47	1.44	1.41	1.38	1.34	1.31	1.29
s w	2.42	2.38	2.35	2.51	2.27	2.23	2.19	2.14	2.10	2.06	2.06
sw by w	3.28	3.24	3.19	3.14	3.09	3.04	2.59	2.54	2.49	2.44	2.45
w s w	4.17	4.11	4.06	4.01	3.55	3.49	3.43	3.38	3.32	3.26	3.22
w by s	5.08	5.02	4.56	4.50	4.44	4.38	4.32	4.25	4.19	4.13	4.09
West.	5.00	5.54	5.48	5.42	5.36	5.29	5.23	5.16	5.09	5.04	4.99
w by n				6.35	6.29	6.22	6.16	6.10	6.03	5.98	5.93
w n w						7.16	7.10	7.04	6.58	6.53	6.48
n w w								7.57	7.52	7.48	7.43
n w									8.42	8.38	8.33
let	6.00	6.16	6.32	6.50	7.08	7.27	7.46	8.07	8.29	8.45	9.02
Sun's d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	10.00	4.5	9.45	14.4	19.42	24.51	30.10	35.42	41.37	46.40	5.44

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49
s w	1.18	1.20	1.22	1.24	1.26	1.28	1.31	1.33	1.35	1.37	1.38
sw by s	1.59	2.02	2.05	2.08	2.11	2.14	2.18	2.21	2.24	2.27	2.29
s w	2.42	2.46	2.50	2.54	2.58	3.02	3.06	3.11	3.15		
sw by w	3.28	3.33	3.38	3.43	3.47	3.52	3.57				
w s w	4.17	4.22	4.28	4.33	4.39						
w by s	5.08	5.14	5.19								
West.	6.00										
Net	10.00	5.44	5.27	5.10	4.5	4.33	4.14	3.52	3.21	2.13	2.55

A Sun-Dial for the Latitude of 60 Degrees.

North Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.39	0.38	0.37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.29
s s w	1.19	1.17	1.15	1.13	1.11	1.09	1.07	1.05	1.03	1.01	1.00
sw by s	2.00	1.57	1.54	1.51	1.48	1.45	1.42	1.39	1.36	1.33	1.31
s w	2.44	2.40	2.36	2.33	2.28	2.24	2.20	2.16	2.12	2.08	2.05
sw by w	3.29	3.25	3.20	3.16	3.11	3.06	3.01	2.56	2.51	2.47	2.44
w s w	4.18	4.13	4.07	4.02	3.57	3.51	3.46	3.40	3.34	3.29	3.25
w by s	5.08	5.03	4.57	4.51	4.45	4.40	4.34	4.27	4.21	4.16	4.11
West.	5.00	5.54	5.48	5.42	5.36	5.31	5.24	5.18	5.11	5.06	5.00
w by n				6.35	6.29	6.23	6.17	6.11	6.04	5.59	5.53
w n w						7.16	7.10	7.04	6.59	6.54	6.48
n w by w								7.57	7.52	7.48	7.44
n w										8.41	8.37
☉ set.	6.00	6.17	6.35	6.53	7.11	7.30	7.51	8.13	8.36	8.58	9.19
Sun's	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.	d.m.
Amp.	0.00	5.00	10.21	5.5	20.15	25.39	31.10	36.58	43.10	48.32	52.5

South Declination.

Deg.	0	d 2	d 5	d 7	d 10	d 12	d 15	d 17	d 20	d 22	d 23
Min.		30m		30m		30m		30m		30m	
Point.	h	m	h	m	h	m	h	m	h	m	h
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49
s s w	1.19	1.21	1.23	1.25	1.27	1.29	1.31	1.33	1.35	1.37	1.39
sw by s	2.00	2.03	2.06	2.09	2.12	2.15	2.18	2.21	2.24	2.27	2.30
s w	2.44	2.47	2.51	2.55	2.59	3.03	3.07	3.11	3.15		
sw by w	3.29	3.34	3.39	3.43	3.48	3.53	3.58				
w s w	4.18	4.23	4.28	4.33	4.39						
w by s	5.08	5.14	5.20								
West	6.00										
☉ set.	6.00	5.43	5.25	5.07	4.49	4.30	4.09	3.47	3.24	3.02	2.40

The Description and Use of the foregoing Sun-Dial
T A B L E S.

These Tables are tituled at the head of each Page thus;
A Sun-Dial for the Latitude of 0 Degrees; the next is,
A Sun-Dial for the Latitude of 1 Degree; and so on order-
ly unto 60 Degrees, making in all 61 Dials; from Page,
24 to Page 84.)

Each Dial hath two Tables, (the uppermost for North
Declination, the lowermost for South Declination) and
2 Columns in each Table: At the head of each Column,
and right against Deg Min. are the Degrees of Declina-
tion; thus, 10 d | 2 d 30 m | 5 d | 7 d 30 m | 10 d | 12 d 30 m.
15 d | 17 d 30 m | 20 d | 22 d | 23 d 30 m | d standing for
degree, and m for Minute.

Under those Degrees and Minutes of Declination in
each Column is set, | h m |; h stands for Hour, and m
for Minute of an Hour.

In the Left-hand Column of each Table, under Points,
(at the head) is the Points of the Compass, thus South;
S. by W; S. S. W; S W. by S; S. W; &c. S. by W. stand-
ing for South and by West; S. S. W. for South South
West; S. W. by S. for South West by South, and so for
the rest.

At the Foot of each Table, is the Sun's setting and
Sun's Amplitude, agreeable to those several Declinations
at the head of each Column; and are distinguished from
the rest by the Words in the Left-hand Column, thus; ☉
Sun's Amplitude, or so much of them as the Column
contain. Note, The Sun's Setting is annexed to
each Table, but the Sun's Amplitude only to that for
North Declination, because it's the same (for quantity)
for South Declination.

The Sun's Setting is Hours, and Minutes, but the Am-
plitude is Degrees and and Minutes, having (d) over the
degrees, and (m) over the Minutes.

By these Tables (being Sun's-Dials for all Latitudes) may be known the Time of the Day, the Sun being visible in any part of the Hemisphere, as true and exact as tho' he were upon the Meridian; also his Rising, Setting and Amplitude. The Like may be known by any Star, whose Declination doth not exceed 23d. 30m. as will be evident by the following Propositions.

Proposition 1. **T**HE Latitude of the Place, the Sun's Declination, and its Bearing given; to find the Hour of the Day.

Note, By Bearing, is meant the Azimuth, or Point of the Compass he is upon; and that is found by setting the Sun with an Azimuth Compass, which is the truest way, and to be preferred before, setting the Sun by a Common Compass.

The Resolution of this Proposition, is thus:

1. Seek the Sun-Dial Table for the given Latitude.
2. At the head of the Table seek the given Declination, or the nearest to it.
3. Find the given Bearing, among the Points of the Compass in the Left-hand Column.
4. Then look straight to the Right-hand of the Bearing, till you come right under the Declination, (before found in the head of the Table) and what Number you find there, is the Hour Required.

Example 1. In the Latitude of 30 degrees the Sun having 15 degrees North Declination, I desire to know at what a Clock the Sun cometh upon the S.W. Point of the Compass?

Look for the Table that belongeth to the Latitude of 30 degrees, in the head of the Table, which is in Page 34, and look for 15d. in the Column under North Declination, and for S.W. on the Left-hand of the Table, and then in the common Angle of meeting you'll find the Hour of the Day to be oh. 58m. that is 58m. past 12 a Clock the Time required.

Example 2. I desire to know at what a Clock the Sun cometh to the S. W. in the Latitude of 30 degrees, the Sun having 15 degrees South Declination? *Answer,* 34 minutes past 2 a Clock.

For if you turn to the *Dial* for Latitude 30 degrees in Page 54, and in the Table for South Declination, seek 15 d. at the head of it, under which, and right against S. W. (on the Left-hand) you'll find 2 h. 34 m. the time of the Day required

If the Declination be not the same with the Declination in the Head of the Table; then look under that Declination nearest to the Declination proposed.

But more exactly thus, Find the Hour for the next declination both lesser, and greater than the Declination proposed, and take the Difference of those Hours, as also of the Declinations belonging to them: then say,

As the last Difference is to the first Difference, so is the Difference between the Declination proposed, and the next lesser in the Table, to a fourth Proportional, which add to (when the Hour in the Table increaseth) or (when it decreaseth) subtract from the Hour belonging to the lesser Declination) afore said: So you'll have the Hour Required exact to the Declination proposed.

Example 3. Admit the Declination to be 18 d. 20 min. North, I desire to know at what a Clock the Sun cometh upon the W. S. W. Point of the Compass, in the Latitude of 30 degrees

In the Table, the nearest Number to 18d. 20m. is 17 d. 30m. Then under 17d. 30m. and against W.S.W. is 1 h. 42m. which sheweth that the Sun cometh upon the W.S.W. Point of the Compass, at 42m. past one a Clock.

Now because the Declination proposed, and the Declination in the head of the Table, are somewhat Different; therefore you may make a Proportion, very easily, thus, under 17d. 30m. and against W.S.W. you find

1 h. 42 m. and under 20 d 0 m. you find 1 h. 25 m. the *Difference* between these two Numbers is 17 m. And the *Difference* between the *Declination* 17 d. 30 m. and 20 d. is 2 d. 30 m. or 150 m. Also the *Difference* between the *Declination* 18 d. 20 m. and 17 d. 30 m. is 50 m. Then say, As 150 m. is to 17 m. so is 50 m. to 6 m. almost: But because 50 is $\frac{1}{3}d$ of 150, therefore the $\frac{1}{3}d$ part of 17 m. is near 6 m. which subtracted from 1 h. 42 m. (because the Hour decreaseth) and the Remainder 1 h. 36 m. is the true Hour of the Day, the Sun being upon the W.S.W. Point of the *Compass*, having 18 d. 20 m. North *Declination*.

Do the like with any other degrees and minutes of *Declination*. But if the *Declination* be not much *Differing* from that in the Head of the Table, you need not make any *Proportion*: Likewise when the Sun is near the *Meridian*, you need not make any *Proportion*. because there the *Difference* is but small.

Note, There is none but the *Afternoon Points* in the *Tables* of these *Dials*, yet you may easily find the Time of the Day for the *Forenoon Points* by what follows.

For *Points* equally distant from the *Meridian*, are equal Time from Noon, so that at what space of Time from Noon the Sun is S. E. in the Forenoon, the like Space of Time from Noon, he is S. W. Afternoon.

As in the *Table* following, the *Points* that stand right against one another, are equally distant from the *Meridian*; therefore to find the Hour of the Day, the Sun being upon any of the *Forenoon Points*, see what Time of the Day it's when the Sun is upon the *Afternoon Points* that stands right against the *Forenoon Points* desired, and subtract those Hours and Minutes from 12 Hours, the Remainder is the Hour and Minute of the Day Required.

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*A Table of Points of the Compass equally
Distant from the Meridian.*

<i>Forenoon Points.</i>		<i>Afternoon Points.</i>	
South.		South.	
S. by E.		S. by W.	
S. S. E.		S. S. W.	
S. E. by S.		S. W. by S.	
S. E.		S. W.	
S. E. by E.		S. W. by W.	
E S. E.		W S. W.	
E. by S.		W. by S.	
East.		West.	
E. by N.		W. by N.	
E. N. E.		W. N. W.	
N. E. by E.		N. W. by W.	
N. E.		N. W.	
N. E. by N.		N. W. by N.	
N. N. E.		N. N. W.	
N. by E.		N. by W.	
North.		North.	
<i>Forenoon Points.</i>		<i>Afternoon Points.</i>	

Example 4. In the Latitude of 60 degrees, the Sun being N. E. I demand the Hour of the Day, the Sun having 22 degrees North Declination?

In the *Sun-Dial* for Latitude 60 degrees, (in Page 84) look against N. W. (which is the *Afternoon Point* correspond to N. E. the *Forenoon Point*,) and finding the *Declination* 22 degrees in the Head of the Table, in the common Angle of meeting is 8 Hours 41 Minutes, which subtract from 12 Hours, the Remainder 3 Hours 19 Minutes

Minutes is the Hour of the Day desired in the Morning.

Example 5. The Sun being in E. N. E. in the same Latitude, with the same Declination; I demand the Hour of the Day?

In Latitude 60 degrees, and North Declination 22 degrees, the Sun being W. N. W. it is 54 minutes past 6 a Clock in the *Afternoon*; which subtract from 12 Hours, the Remainder is 6 Minutes past 5 in the *Morning*; the Time desired.

Example 6. In the Latitude of 35 degrees North, the Sun having 15 degrees North Declination, the Sun being S. E. by E. I demand the Hour and Minute of the Day?

In the Table for Latitude 35 degrees (in Page 59) look against S.W. by W. (the *Afternoon* Point correspondent to S.E. by E. the *Forenoon* Point.) And the Declination 15d. in the Head of the Table, and in the common Angle of meeting is 1h. 45m. which deducted from 12 Hours, the Remainder is 15 minutes past 10 a Clock, the true Time of the Day desired.

Example 7. In the Latitude of 35 degrees North, the Sun having 15 degrees South Declination, and being S.E. by E. I demand the Hour of the Day?

Answer, 20 Minutes past 8 a Clock; for the Hour in the Table is 3 Hours, 40 Minutes, which subtracted from 12 Hours leaveth 8 Hours 20 Minutes, the Hour required.

The like is to be understood in any other Latitude, with any other Declination, and with any other Point of the Compass.

Note; These Tables serve as well in South Latitude, as in North Latitude, only the Difference will be this:

If the Latitude be contrary, then the Declination must be contrary; and the Points of the Compass contrary; that is to say, North Declination must be counted South; and South Declination must be counted North; and South must

must be North; and S. by W. must be N. by W. and S. W. must be N. N. W. and S W. by S. must be N. W. by N. and so for any other Point, as in the following Table

A Table of Points equally distant from Noon, both in North Latitude, and in South Latitude; either before Noon or after Noon.

North Latitude.		South Latitude.	
Forenoon.	Afternoon.	Forenoon.	Afternoon.
S. by E.	S. by W.	N. by E.	N. by W.
S S. E.	S S. W.	N. N. E.	N. N. W.
S E. by S.	S. W. by S.	N. E. by N.	N. W. by N.
S. E.	S. W.	N. E.	N. W.
S. E. by E.	S. W. by W.	N E by E.	N. W. by W.
E. S. E.	W S. W.	E. N. E.	W. N. W.
E. by S	W. by S	E. by N.	W. by N.
East.	West.	East.	West.
E. by N.	W. by N.	E. by S.	W. by S.
E. N. E.	W. N. W.	E. S. E.	W. S. W.
N. E. by E.	N. W. by W.	S E. by E.	S. W. by W.
N. E.	N. W.	S. E.	S. W.
N. E. by N.	N. W. by N.	S. E. by S.	S. W. by S.
N. N. E.	N. N. W.	S. S. E.	S. S. W.
N. by E.	N by W.	S. by E.	S. by W.
North.	North.	South. S.	South.

Proposition 2. *To find the Hour of the Night by the Stars and the Table of the Sun-Dial.*

YOU may find the Hour of the Night, by the Bearing of any known Star, whose Declination doth not exceed the Sun's greatest Declination; after this manner.
Find the Time of the Star's coming to the Meridian on the

the Day proposed; then if the Star be on the East side of the Meridian, subtract the Hours and Minutes which these Tables shew, from the Time of the Star's coming to the Meridian, the Remainder is the Hour of the Night. But if the Star be on the West side of the Meridian, then add those Hours and Minutes aforesaid, to the Time of the Star's coming to the Meridian, the Sum is the Hour of the Night

To find a Star's coming on or to the Meridian, see the *Seaman's Kalender*, in the Uses of the Tables of the Sun's and Star's Right Ascension, Page 91, 92, 93, &c. or *Mariner's Kalender*, Page 57, 58, 59, 60, &c.

Example 8. Admit the 6th Day of *October*, in the Latitude 40 Degrees North, I observe the *Bull's Eye* to be S. E. I demand the Hour of the Night?

The 6th Day of *October* the *Bull's Eye* cometh on the Meridian at 51 Minutes past 2 a Clock in the Morning; this Star's Declination is 15 deg. 50 m. North, therefore in the Table that belongs to 40 Degrees in Page 64, seek in the Head of the Table the Declination of the Star, and by the Side, the Point of the Compass, and in the common Angle of meeting, is 1 hour 31 m. which subtract from 2 hours 51 m. the Star's Southing, the Remainder 1 hour 20 m. is the Hour of the Night desired, But if this Star had born S. W. you must have added, and then the Hour would have been 22 min. past 4 a Clock in the Morning.

The Operation.

	h.	m
The Time of the Star's being on the Meridian	2.	51 m.
His Dist. from the Mer. either at S. E. or S. W.	1.	31 m.
The Time of the Night, the Star being S. E.	1.	20 m.
The Time of the Night, the Star being S. W.	4.	22

Ex.

The Mariners Compass Rectified.

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Example 9. Admit the 1st Day of November, in Latitude 45 Degrees North. I see the *Lion's Tail* upon the E. S. E. Point of the Compass, having Declination 16d. 12 min. North, I demand the Hour of the Night;

The Operation.

h. m.

Time of this Star's being on the Meridian 08. 07 Morn.
His Distance from the Meridian, being 03. 00

Time of the Night, the Star is E. S. E. 05. 07 Morn.

Time when this Star is W. S. W. ——— 11. 07 Morn.

Note; If the Compass hath Variation, you must allow for the Variation: But if you will use this following Instrument, I call a Rectifier, you need not reckon which way the Variation is, either Eastward or Westward; for this Instrument will do it so plain, that you cannot be mistaken, as is shewn in the following part of this Book: But for the present I will only give you one Proposition, and apply it upon the Rectifier, which is as followeth.

Admit in Latitude 47 Degrees North, the Sun being in one of the Equinoctial Points, (at which Time he hath no Declination) I observe the Sun to Rise upon the E. S. E. Point of the Compass; I demand the Variation?

The Sun having no Declination in any Latitude (if there be no Variation) the Sun will rise at East, and set at West; but according to the foregoing Proposition, the Sun did Rise at E. S. E. therefore there is two Points Variation, as will appear by the following Rectifier.

The Description of the Rectifier.

THIS Instrument containeth two Circles or Compasses one within the other; but as it is made in Wood, the one moveth upon the other; so that the inward or upper

upper Circle, representeth the Compass that you Steer by, which is subject to Variation; but the outward or under Circle, representeth a True Compass that never varieth. And by it you may readily Rectify your *Compass*, when it doth vary; thus:

Always bring the true Point of Rising, or Setting on the outward or under Compass, to touch the false Point of Rising, or Setting on the inward or upper Compass, there let the Instrument stand.

As in this foregoing Proposition: The East point is the True Point of Rising, and the E.S.E. Point is the False Point of Rising, therefore bring the East point on the outward or under Compass, to touch the E.S.E. Point on the inward or upper Compass.

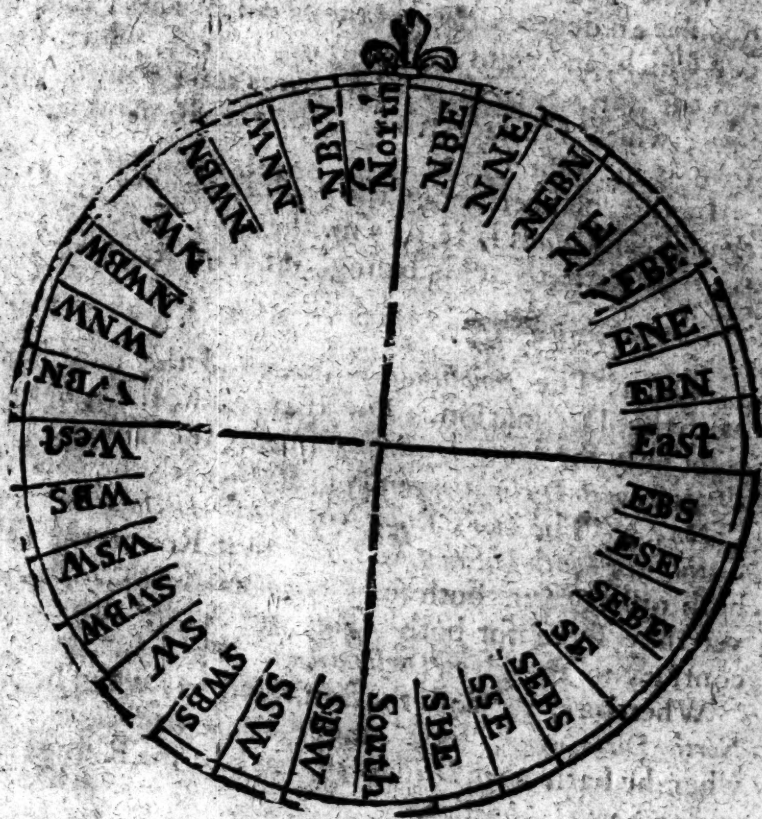
Then the Points that are upon the outward Compass, do explain the Points that are upon the inward Compass: So that according to this Observation the N.N.E. Point on your Compass, is the True North Point; and the North is the True N. N. W. and the N. W. is True W. N. W. and the West, is the True W. S. W. Point; as plainly appears by the Rectifier.

Note, The True Points are always counted on the outward Circle or Compass.

This Instrument in Wood, is larger than this Figure, and there the Points be divided into Halves and Quarters; as also each Compass (in some) is divided into 360 degrees, numbered from the North, and South, both ways towards the East and West, ending there in 90 degrees.

A RECTIFIER.

Proposition 3. *To find the Sun's Rising, Setting, or Amplitude by the Table of Sun Dial.*



IN the Table for the Latitude of the Place, seek the Declination, under which, and against ☉ Set, is the Sun's Setting; and against Sun's Amp. is the Amplitude. And

And if you substract the *Sun's Setting* from 12 Hours, it gives his *Rising*.

Example 10. Latitude 50 degrees North, *Sun's Declination* 20 degrees North: I demand his *Rising*, *Setting*, and his *Amplitude*.

In the Table for 50 degrees (in Page 74) seek the *Declination* 20 degrees North at the Head of the Table, under which, and right against $\odot$ *Set.* is 7.45, which sheweth the *Sun's Setting* at 45 Minutes after 7 in the *Afternoon*; which subtract from 12 h. the Remainder 4 h. 17 m. is his *Rising*.

In like manner under the *Sun's Declination* 20 d. and against *Sun's Amp.* is 32 d. 9 m. the *Sun's Amplitude*; that is, *East Northerly* at his *Rising*, but *West Northerly* at his *Setting*.

Note, 1. The *Amplitude* is always of the same Name with the *Declination*. For that reason the *Amplitude* is set only for *North Declination*; being the same in Quantity for *South Declination*, only in Quality it's the contrary.

Note, 2. The *Sun's Rising* for *North Declination*, is the *Setting* for *South Declination*. For that Reason the Table hath only $\odot$ *Set.* both for *North*, and *South Declination*; yet they serve for both *Rising* and *Setting*, by looking contrary to the given *Declination*.

Wherefore, to find the *Sun's Rising*, when he hath *North Declination*, look under *South Declination*; and when he hath *South Declination*, (to find his *Rising*) look under *North Declination*.

Note 3. In *South Latitude* with *South Declination*, also in *South Latitude* with *North Declination*; the *Sun's Rising*, and *Setting* is the same as in *North Latitude* with *North Declination*, as also in *North Latitude* with *South Declination*.

There

Therefore these Tables are as useful in South Latitude, as in North Latitude; if North Declination, in these Tables be counted for South, and South for North.

Note 4. The Rising, Setting, and Amplitude of any Star (whose Declination doth not exceed the Sun's greatest Declination) may be found by these Tables; provided its Southing or Time of the Star's coming to or on the Meridian be known.

For the Time of *Sun Setting* in these Tables for any Latitude, is a *Star's* half continuance above the Horizon, having equal Declination, and the same kind with the Sun, for the same Latitude.

Therefore the half continuance of a *Star* above the Horizon, (found in these Tables as before directed) added to, and subtracted from the *Star's* coming to or on the Meridian: the first is the *Star's* Setting, the latter its Rising. Examples of this nature you will find in the Use of the next Tables of Semidiurnal and Seminocturnal Arches, to which the Reader is refer'd.

The Amplitude of a *Star* by the foregoing Tables is found as the Amplitude of the *Sun* was, which is more fully treated on in the Use of the Tables of Amplitude, Page 144.

Astronomical TABLES of Semidiurnal and Seminocturnal Arches: Shewing the True Time of the SUN's Rising, and Setting; with the Length of the Day, and Night; for any Day in the Year; fitting all Places in the World, whose Pole is not elevated above 60 Degrees; either North, or South; and to last with Exactness, as long as God upholds the Course of Nature.

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Decl.	Sun's	1		2		3		4		5		6	
		H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0		6	00	6	00	6	00	6	00	6	00	6	00
1		6	00	6	00	6	00	6	00	6	00	6	00
2		6	00	6	00	6	00	6	00	6	01	6	00
3		6	00	6	00	6	01	6	01	6	01	6	00
4		6	00	6	00	6	01	6	01	6	01	6	00
5		6	00	6	00	6	01	6	01	6	02	6	00
6		6	00	6	01	6	01	6	02	6	02	6	00
7		6	00	6	01	6	01	6	02	6	22	6	00
8		6	00	6	01	6	02	6	02	6	03	6	00
9		6	01	6	01	6	02	6	03	6	03	6	00
10		6	01	6	01	6	02	6	03	6	04	6	00
11		6	01	6	01	6	02	6	03	6	04	6	00
12		6	01	6	02	6	02	6	03	6	04	6	00
13		6	01	6	02	6	03	6	04	6	05	6	00
14		6	01	6	02	6	03	6	04	6	05	6	00
15		6	01	6	02	6	03	6	04	6	05	6	00
16		6	01	6	02	6	03	6	05	6	06	6	00
17		6	01	6	02	6	04	6	05	6	06	6	00
18		6	01	6	03	6	04	6	05	6	07	6	00
19		6	01	6	03	6	04	6	05	6	07	6	00
20		6	01	6	03	6	04	6	06	6	07	6	00
21		6	02	6	03	6	05	6	06	6	08	6	00
22		6	02	6	03	6	05	6	06	6	08	6	00
23		6	02	6	03	6	05	6	07	6	09	6	00
23.31		6	02	6	04	6	05	6	07	6	09	6	00

Degrees of Declination.

Table shewing the Semidiurnal-Arch, or Time of Sun-setting when the Sun hath North Declination; and the Seminocturnal Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Declination	7		8		9		10		11		12	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	6	00	6	00	6	00	6	00	6	00	6	00
1	6	00	6	00	6	01	6	01	6	01	6	01
2	6	01	6	01	6	01	6	01	6	02	6	02
3	6	01	6	02	6	02	6	02	6	02	6	03
4	6	02	6	02	6	02	6	03	6	03	6	03
5	6	02	6	03	6	03	6	04	6	04	6	04
6	6	03	6	03	6	04	6	04	6	05	6	05
7	6	03	6	04	6	04	6	05	6	05	6	06
8	6	04	6	04	6	05	6	06	6	06	6	07
9	6	04	6	05	6	06	6	06	6	07	6	08
10	6	05	6	06	6	06	6	07	6	08	6	09
11	6	05	6	06	6	07	6	08	6	09	6	09
12	6	06	6	07	6	08	6	09	6	09	6	10
13	6	06	6	07	6	08	6	09	6	10	6	11
14	6	07	6	08	6	09	6	10	6	11	6	12
15	6	08	6	09	6	10	6	11	6	12	6	13
16	6	08	6	09	6	10	6	12	6	13	6	14
17	6	09	6	10	6	11	6	12	6	14	6	15
18	6	09	6	10	6	12	6	13	6	14	6	16
19	6	10	6	11	6	13	6	14	6	15	6	17
20	6	10	6	12	6	14	6	15	6	16	6	18
21	6	11	6	12	6	14	6	16	6	17	6	19
22	6	11	6	13	6	15	6	16	6	18	6	20
23	6	12	6	14	6	15	6	17	6	19	6	21
31	6	12	6	14	6	16	6	18	6	19	6	22

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decl.	13		14		15		16		17		18	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	6	00	6	00	6	00	6	00	6	00	6	00
1	6	01	6	01	6	01	6	01	6	01	6	01
2	6	02	6	02	6	02	6	02	6	02	6	02
3	6	03	6	03	6	03	6	03	6	04	6	04
4	6	04	6	04	6	04	6	05	6	05	6	05
5	6	05	6	05	6	05	6	06	6	06	6	06
6	6	06	6	06	6	06	6	07	6	07	6	08
7	6	06	6	07	6	07	6	08	6	09	6	09
8	6	07	6	08	6	09	6	09	6	10	6	10
9	6	08	6	09	6	10	6	10	6	11	6	12
10	6	09	6	10	6	11	6	12	6	12	6	13
11	6	10	6	11	6	12	6	13	6	13	6	14
12	6	11	6	12	6	13	6	14	6	15	6	16
13	6	12	6	13	6	14	6	15	6	16	6	17
14	6	13	6	14	6	15	6	16	6	17	6	19
15	6	14	6	15	6	16	6	18	6	19	6	20
16	6	15	6	16	6	18	6	19	6	20	6	21
17	6	16	6	17	6	19	6	20	6	21	6	23
18	6	17	6	19	6	20	6	21	6	23	6	24
19	6	18	6	20	6	21	6	23	6	24	6	26
20	6	19	6	21	6	22	6	24	6	25	6	27
21	6	20	6	22	6	24	6	25	6	27	6	29
22	6	21	6	23	6	25	6	27	6	28	6	30
23	6	22	6	24	6	26	6	28	6	30	6	32
23.31	6	22	6	25	6	27	6	29	6	31	6	33

Degrees of Declination.

Degrees of Declination.

A Table shewing the Semidiurnal Arch, or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decl.	19	20	21	22	23	24
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
0	6 00	6 00	6 00	6 00	6 00	6 00
1	6 01	6 01	6 01	6 02	6 02	6 02
2	6 03	6 03	6 03	6 03	6 03	6 03
3	6 04	6 04	6 05	6 05	6 05	6 05
4	6 05	6 06	6 06	6 06	6 07	6 07
5	6 07	6 07	6 08	6 08	6 09	6 09
6	6 08	6 09	6 09	6 10	6 10	6 11
7	6 10	6 10	6 11	6 11	6 12	6 13
8	6 11	6 12	6 12	6 13	6 14	6 14
9	6 13	6 13	6 14	6 15	6 15	6 16
10	6 14	6 15	6 16	6 16	6 17	6 18
11	6 15	6 16	6 17	6 18	6 19	6 20
12	6 17	6 18	6 19	6 20	6 21	6 22
13	6 18	6 19	6 20	6 21	6 23	6 24
14	6 20	6 21	6 22	6 23	6 24	6 25
15	6 21	6 22	6 24	6 25	6 26	6 27
16	6 23	6 24	6 25	6 27	6 28	6 29
17	6 24	6 25	6 27	6 28	6 30	6 31
18	6 26	6 27	6 29	6 30	6 32	6 33
19	6 27	6 29	6 30	6 32	6 34	6 35
20	6 28	6 30	6 32	6 34	6 36	6 37
21	6 30	6 32	6 34	6 36	6 37	6 39
22	6 31	6 33	6 35	6 37	6 39	6 41
23	6 33	6 35	6 37	6 39	6 41	6 43
24	6 34	6 36	6 38	6 40	6 43	6 45

A Table shewing the Semidiurnal-Arch, or the Time of Sunsetting, when the Sun hath North Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Decl. Sun's	25	26	27	28	29	30
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
0	6 00	6 00	6 00	6 00	6 00	6 00
1	6 02	6 02	6 02	6 02	6 02	6 02
2	6 04	6 04	6 04	6 04	6 04	6 05
3	6 06	6 06	6 06	6 06	6 07	6 07
4	6 07	6 08	6 08	6 09	6 09	6 09
5	6 09	6 10	6 10	6 11	6 11	6 12
6	6 11	6 12	6 12	6 13	6 13	6 14
7	6 13	6 14	6 14	6 15	6 16	6 16
8	6 15	6 16	6 16	6 17	6 18	6 19
9	6 17	6 18	6 19	6 19	6 20	6 21
10	6 19	6 20	6 21	6 22	6 23	6 23
11	6 21	6 22	6 23	6 24	6 25	6 26
12	6 23	6 24	6 25	6 26	6 27	6 28
13	6 25	6 26	6 27	6 28	6 29	6 31
14	6 28	6 28	6 29	6 30	6 32	6 33
15	6 29	6 30	6 31	6 33	6 34	6 36
16	6 31	6 32	6 34	6 35	6 37	6 38
17	6 33	6 34	6 36	6 37	6 39	6 41
18	6 35	6 36	6 38	6 40	6 42	6 43
19	6 37	6 39	6 43	6 42	6 44	6 46
20	6 39	6 41	6 43	6 45	6 47	6 48
21	6 41	6 43	6 45	6 47	6 49	6 51
22	6 43	6 45	6 48	6 50	6 52	6 54
23	6 46	6 48	6 50	6 52	6 54	6 57
23, 31	6 47	6 49	6 51	6 53	6 56	6 59

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or the Time of Sun-rising when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decl.	31		32		33		34		35		36	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	6	00	6	00	6	00	6	00	6	00	6	00
1	6	02	6	02	6	03	6	03	6	03	6	03
2	6	05	6	05	6	05	6	05	6	06	6	06
3	6	07	6	08	6	08	6	08	6	08	6	09
4	6	10	6	10	6	10	6	11	6	11	6	12
5	6	12	6	13	6	13	6	14	6	14	6	15
6	6	15	6	15	6	16	6	16	6	17	6	18
7	6	17	6	18	6	18	6	19	6	20	6	20
8	6	19	6	20	6	21	6	22	6	23	6	23
9	6	22	6	23	6	24	6	25	6	25	6	26
10	6	24	6	25	6	26	6	27	6	28	6	29
11	6	27	6	28	6	29	6	30	6	31	6	32
12	6	29	6	31	6	32	6	33	6	34	6	36
13	6	32	6	33	6	34	6	36	6	37	6	39
14	6	34	6	36	6	37	6	39	6	40	6	42
15	6	37	6	39	6	40	6	42	6	43	6	45
16	6	40	6	41	6	43	6	45	6	46	6	48
17	6	42	6	44	6	46	6	48	6	49	6	51
18	6	45	6	47	6	49	6	51	6	53	6	55
19	6	48	6	50	6	52	6	54	6	56	6	58
20	6	51	6	53	6	55	6	57	6	59	7	01
21	6	53	6	56	6	58	7	00	7	02	7	05
22	6	56	6	58	7	01	7	03	7	06	7	08
23	6	59	7	01	7	04	7	06	7	09	7	12
23 31	7	01	7	03	7	06	7	08	7	11	7	14

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal-Arch, or the Time of Sun-rising when the Sun hath South Declination,

The Degrees of Latitude.

Sun's Decl.	37		38		39		40		41		42	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	6	00	6	00	6	00	6	00	6	00	6	00
1	6	03	6	03	6	03	6	03	6	03	6	04
2	6	06	6	06	6	06	6	07	6	07	6	07
3	6	09	6	09	6	10	6	10	6	10	6	11
4	6	12	6	13	6	13	6	13	6	14	6	14
5	6	15	6	16	6	16	6	17	6	17	6	18
6	6	18	6	19	6	20	6	20	6	21	6	22
7	6	21	6	22	6	23	6	24	6	25	6	25
8	6	24	6	25	6	26	6	27	6	28	6	29
9	6	27	6	28	6	29	6	31	6	32	6	33
10	6	31	6	32	6	33	6	34	6	35	6	37
11	6	34	6	35	6	36	6	38	6	39	6	40
12	6	37	6	38	6	40	6	41	6	43	6	44
13	6	40	6	42	6	43	6	45	6	46	6	48
14	6	43	6	45	6	47	6	48	6	50	6	52
15	6	47	6	48	6	50	6	52	6	54	6	56
16	6	50	6	52	6	54	6	56	6	58	7	00
17	6	53	6	55	6	57	7	00	7	02	7	04
18	6	57	6	59	7	01	7	03	7	06	7	08
19	7	00	7	02	7	05	7	07	7	10	7	12
20	7	04	7	06	7	09	7	11	7	14	7	17
21	7	07	7	10	7	12	7	15	7	18	7	21
22	7	11	7	14	7	16	7	19	7	22	7	25
23	7	15	7	17	7	20	7	23	7	27	7	30
24-31	7	17	7	19	7	22	7	26	7	29	7	32

Degrees of Declination.

Degrees of Declination.

Degrees of Declination.

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A Table showing the Semidiurnal-Arch, or Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decl.	43		44		45		46		47		48	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	6	00	6	00	6	00	6	00	6	00	6	00
1	6	04	6	04	6	04	6	04	6	04	6	04
2	6	07	6	08	6	08	6	08	6	09	6	09
3	2	11	6	12	6	12	6	12	6	13	6	13
4	6	15	6	15	6	16	6	17	6	17	6	18
5	6	19	6	19	6	20	6	21	6	22	6	22
6	6	22	6	23	6	24	6	25	6	26	6	27
7	6	26	6	27	6	28	6	29	6	30	6	31
8	6	30	6	31	6	32	6	33	6	35	6	36
9	6	34	6	35	6	36	6	38	6	39	6	41
10	6	38	6	39	6	41	6	42	6	44	6	45
11	6	42	6	43	6	45	6	46	6	48	6	50
12	6	46	6	47	6	49	6	51	6	53	6	55
13	6	50	6	52	6	53	6	55	6	57	6	59
14	6	54	6	56	6	58	7	00	7	02	7	04
15	6	58	7	00	7	02	7	04	7	07	7	09
16	7	02	7	04	7	07	7	09	7	12	7	14
17	7	06	7	09	7	11	7	14	7	17	7	19
18	7	11	7	13	7	16	7	19	7	22	7	25
19	7	15	7	18	7	21	7	24	7	27	7	30
20	7	19	7	22	7	25	7	29	7	32	7	35
21	7	24	7	27	7	30	7	34	7	37	7	41
22	7	28	7	31	7	35	7	39	7	43	7	47
23	7	33	7	37	7	40	7	44	7	48	7	53
23-31	7	36	7	39	7	43	7	47	7	51	7	56

Degrees of Declination.

A Table shewing the Semi-diurnal-Arch, or the Time of Sun-setting, when the Sun hath North Declination; and the Semi-nocturnal-Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decl.	49		50		51		52		53		54	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	6	00	6	00	6	00	6	00	6	00	6	00
1	6	05	6	05	6	05	6	05	6	05	6	06
2	6	09	6	10	6	10	6	10	6	11	6	11
3	6	14	6	14	6	15	6	15	6	16	6	17
4	6	18	6	19	6	20	6	21	6	21	6	22
5	6	23	6	24	6	25	6	26	6	27	6	28
6	6	28	6	29	6	30	6	31	6	32	6	33
7	6	32	6	34	6	35	6	36	6	38	6	39
8	6	37	6	39	6	40	6	41	6	43	6	45
9	6	42	6	44	6	45	6	47	6	49	6	50
10	6	47	6	49	6	50	6	52	6	54	6	56
11	6	52	6	54	6	56	6	58	7	00	7	02
12	6	57	6	59	7	01	7	03	7	06	7	08
13	7	02	7	04	7	06	7	09	7	11	7	14
14	7	07	7	09	7	12	7	14	7	17	7	20
15	7	12	7	14	7	17	7	20	7	23	7	27
16	7	17	7	20	7	23	7	26	7	29	7	33
17	7	22	7	25	7	29	7	32	7	36	7	40
18	7	28	7	31	7	35	7	38	7	42	7	46
19	7	33	7	37	7	41	7	45	7	49	7	53
20	7	39	7	43	7	47	7	51	7	56	8	00
21	7	45	7	49	7	53	7	58	8	02	8	08
22	7	51	7	55	8	00	8	05	8	10	8	16
23	7	57	8	02	8	06	8	12	8	17	8	23
23.31	8	00	8	05	8	10	8	16	8	21	8	27

Degrees of Declination.

A Table shewing the Semidiurnal Arch, or the Time of Sunsetting, when the Sun hath North Declination; and the Seminocturnal Arch, or the Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decl.	55		56		57		58		59		60	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	6	00	6	00	6	00	6	00	6	00	6	00
1	6	06	6	06	6	06	6	06	6	07	6	07
2	6	11	6	12	6	12	6	13	6	13	6	14
3	6	17	6	18	6	19	6	19	6	20	6	21
4	6	23	6	24	6	25	6	26	6	27	6	28
5	6	29	6	30	6	31	6	32	6	33	6	35
6	6	35	6	36	6	37	6	39	6	40	6	42
7	6	40	6	42	6	44	6	45	6	47	6	49
8	6	46	6	48	6	50	6	52	6	54	6	56
9	6	52	6	54	6	56	6	59	7	01	7	04
10	6	58	7	00	7	03	7	06	7	08	7	11
11	7	04	7	07	7	10	7	13	7	16	7	19
12	7	11	7	13	7	16	7	20	7	23	7	26
13	7	17	7	20	7	23	7	27	7	30	7	34
14	7	23	7	27	7	30	7	34	7	38	7	42
15	7	30	7	34	7	38	7	42	7	46	7	51
16	7	37	7	41	7	45	7	49	7	54	7	59
17	7	44	7	48	7	52	7	57	8	03	8	08
18	7	51	7	55	8	00	8	05	8	11	8	17
19	7	58	8	03	8	08	8	14	8	20	8	26
20	8	05	8	10	8	16	8	22	8	29	8	36
21	8	13	8	19	8	25	8	32	8	39	8	47
22	8	21	8	27	8	34	8	41	8	49	8	56
23	8	29	8	36	8	43	8	51	9	00	9	09
23.31	8	34	8	41	8	48	8	56	9	05	9	12

Degrees of Declination.

The USE of the foregoing Tables, of *Semi-diurnal* and *Seminocturnal-Arches*.

To find the Time of the Sun's Rising, Setting, and the Length of the Day, and of the Night by these Tables.

FIRST, seek the Sun's Declination in the Tables of Declination, for the Day proposed, with which enter the Table of Semidiurnal and Seminocturnal-Arches; finding the Latitude of the Place, in the Head of this Table, and the Degree of the Sun's Declination, in the First Column on the Left-hand; and in the common Angle of Meeting is the Semidiurnal Arch, if the Sun hath North Declination; but it's the Seminocturnal-Arch, if the Sun hath South Declination.

Example 1. For Illustration hereof, let it be required to find the Time of the Sun's Rising, Setting, and the Length of the Day and Length of the Night for the 23^d Day of April 1718, in Latitude 46 Degrees North.

At which Time the Sun's Declination is 15 d. 55 min. North, with which enter the Table, as before is declared, and the Semidiurnal-Arch is 7 Hours 9 Minutes the True Time of Sun-setting; whose Complement to 12 Hours, is the Seminocturnal-Arch, or the time of Sun rising, and is 4 Hours 51 Min. Double the Semidiurnal-Arch, you have the Length of the Day; Double the Seminocturnal-Arch, the Aggregate is the Length of the Night. See the Work following.

	H. M.
	12 00
The Semidiurnal-Arch, or Time of Sun-setting	07 09
The Complement to 12 Hours is	04 51

The Seminocturnal-Arch, or Time of Sun rising, in Latitude 46 Degrees North, is 4 Hours 51 Minutes.

The

H. M.

The Semidiurnal Arch doubled ———— { 07 09
 { 07 09

The Length of the Day, *April 23. 1718* is ———— 14 18

The Seminocturnal Arch doubled ———— { 04 31
 { 04 31

The Length of the Night, *April 23. 1718* is ———— 09 42

Example 2. But when the Sun hath 15 Deg. 55 Min. South Declination, in this Latitude of 46 Deg. North.

Then the Day-Arch will be equal to the Night-Arch, and the Night-Arch will be equal to the Day-Arch.

As on *October 26th 1718*, the Sun hath 15 deg. 58 m. South Declination; then the Time of the Sun's Rising is 7 Hours 9 Minutes, his Setting 4 Hours 51 Minutes, the Length of the Day 9 Hours 42 Minutes, and the Length of the Night, 14 Hours 18 Minutes.

Example 3. Let it be Required to find the Time of the Sun's Rising and Setting, with the Length of the Day, and Night, for the 15th Day of *December 1719*, in Latitude 53 Degrees North; at which Time the Sun's Declination is 23 Degrees 25 Minutes South.

H. M.

12 00

The Seminocturnal Arch, or Time of Sun-
 Rising ———— { 08 21
 { 08 21

The Complement to 12 Hours is ———— 03 39

Is the Semidiurnal Arch, or Time of Sun-Setting.

The Semidiurnal Arch doubled ———— { 03 39
 { 03 39

The Length of the Day, *December 15th 1719* 07 18

The Seminocturnal Arch doubled ———— { 08 21
 { 08 21

The Length of the Night, *December 15th 1719* is 16 42

These

These Tables will serve as well in South Latitude as in North, with this Alteration only. When in South Latitude, then Use South Declination there, as you do North Declination here, in North Latitude.

For then these Tables shew the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath South Declination; and the Seminocturnal Arch, or the Time of Sun-rising, when the Sun hath North Declination.

Example 4. Let it be required to find the Time of the Sun's Rising and Setting, with the Length of the Day and Night, for the 23^d Day of April 1720, in Latitude 46 Degrees South.

At which Time the Sun's Declination is 16 Degrees 4 Minutes North; with which enter the Table, and the Seminocturnal-Arch is 7 Hours 9 Minutes, the Time of Sun-rising, whose Complement to 12 Hours, is the Semidiurnal-Arch, or Time of Sun-setting, which is at 51 Minutes past 4 of the Clock.

<i>At 4</i>	<i>Sun's Declination</i>	H. M.
		12 . 00
The Seminocturnal-Arch doubled	— {	07 . 09
		07 . 09
The Length of the Night, April 23 ^d 1720, in	{	14 . 18
Latitude 46 Degrees South ———		
The Semidiurnal-Arch, doubled ———		04 . 51
		04 . 51
The Length of the Day, the 23 ^d of April	{	09 . 42
1720, Latitude 46 Degrees South ———		

Example 5. Let it be Required to find the Time of the Sun's Rising, and Setting, with the Length of the Day, and Night, for the 15th Day of December 1721, in Latitude 53 Degrees South. At which Time the Sun's Declination is 23 Degrees 24 Minutes South; with which enter the Table of Semidiurnal-Archs, &c. and you will find as follows.

H. M

H. M.

12 00

The Seminocturnal Arch, or Time of Sun-setting 08 21

The Seminocturnal Arch, or the Time of Sun-rising 03 39

The Length of the Day ————— 16 42

Length of the Night, December 15th 1721, Latit- }
tude 53 Degrees South ————— } 07 18

To find the Time of a Star's Rising or Setting.

BY these Tables the Time of the Rising, and Setting of all Stars in the Heavens, whose Declinations doth not exceed the Sun's greatest Declination, in any Latitude that the Tables contained and at any Time of the Year, are found in this manner.

If the Star hath North Declination, and you in North Latitude, look for the Latitude in the Head of the Table, the Declination on the Left-hand; and in the common Angle of meeting, is the Star's Semidiurnal Arch, or half the Time that Star doth continue above the Horizon, in that Latitude; or the Distance of Time that Star is in going from the Horizon to the Meridian, on the East-side likewise from the Meridian to the Horizon on the West-side of the Meridian. Now if you subtract these Hours and Minutes from the Time of the Star's coming to the Meridian, the Remainder will be the Time of the Star's Rising, and if you add, the Sum will be the True Time of the Star's setting.

Example 6. Let it be Required to find the Time of the Rising, and Setting of the *Bull's Eye*, November the 18th in the Latitude of 42 Degrees North; the Declination of this Star is 15 Degrees 50 Minutes North; the 18th Day of November this Star cometh on the Meridian at 12 a Clock at Night.

H. M.

	H.	M.
The Time of the Star's Southing —————	12	00
The Semidiurnal-Arch, subtract —————	07	00
Time of the Star's Rising in the Evening ———	05	00
Time of the Star's Setting in the Morning ———	07	00

Note 1. If the Sum of the Addition exceed 12 Hours, cast away 12 Hours.

2. And when you can't subtract, add 12 Hours to the Star's Southing, and then subtract, what remains is its Setting.

Example 7. I desire to know the Time of the Rising, and Setting, of the *Bull's-Eye*, the 18th Day of November, in the Latitude of 13 Degrees North; the Declination of the *Bull's-Eye* is 15 Degrees 50 Minutes North.

	H.	M.
The Time of the Star's Southing —————	12	00
The Semidiurnal-Arch, subtract —————	06	14
The Time of his Rising in the Evening ———	05	46
The Time of his Setting in the Morning ———	06	14

If the Star hath South Declination, and you in North Latitude, look (as before) the Latitude in the Head of the Table, the Declination on the Left-side, and in the common Angle of meeting, is the Star's *Seminocturnal-Arch*, which subtract from 12 Hours, the Remainder is the Star's *Semidiurnal-Arch*, or half the Time that the Star doth continue above the Horizon in that Latitude; therefore subtract those Hours and Minutes from the Time of the Star's coming to the Meridian, adding (12 Hours to the Star's Southing, if otherwise Subtraction can't be made) the Remainder will be the Time of the Star's *Rising*; and if you add the Sum will be the Time of the Star's *Setting*.

Example.

Example 8. Let it be required to find the Time of the Rising, and Setting of the bright Star in the *Great Dog's Mouth*, the 15th Day of *November*, in the Latitude of 50 deg. North. The Declination of the *Great Dog's Mouth*, is 16 d. 15 m. South, and its Southing is 2 hours 24 min. in the Morning, the 15th of *November*.

	H.	M.
The Time of this Star's Southing is, —————	02	. 24
To it Add —————	12	. 00
The Sum is —————	14	. 24
The Seminocturnal Arch, by the Table is ———	07	. 20
Which subtract from —————	12	. 00
The Remainder is the Semidiurnal Arch, ———	04	. 40
Time of Southing, with 12 Hours Added, is ———	14	. 24
The Semidiurnal Arch, subtract —————	04	. 40
Time of the Star's Rising in the Evening, ———	09	. 44
Time of the Star's Setting in the Morning ———	07	. 04

Example 9. I desire to know the Rising, and Setting of the *Great Dog*, the 15th of *November*, in the Latitude of 30 Degrees North.

	H.	M.
Time of Southing, with 12 Hours added ———	14	. 24
The Semidiurnal Arch, subtract —————	05	. 22
Time of the Star's Rising in the Evening ———	09	. 02
Time of the Star's Setting in the Morning, ———	07	. 46

South Latitude, to know the Time of the Rising, and Setting of the Stars.

DO with those Stars that have North Declination, in South Latitude, as with Stars that have South Declination, when in North Latitude.

Example 10. Let it be required to find the Time of Rising and Setting, of the *Bull's Eye* the 18th Day of November, in the Latitude of 42 degrees South.

The Declination of this Star is 15 deg. 50 min. North; the 18th Day of November this Star cometh upon the Meridian at 12 of the Clock at Night.

	H.	M.
The Seminocturnal-Arch, by the Table, is	07	. 00
Which subtract from	12	. 00
The Remainder is the Semidiurnal-Arch,	05	. 00
The Time of the Star's Northing is	12	. 00
The Semidiurnal-Arch, subtract	05	. 00
Time of the Star's Rising in the Evening	07	. 00
Time of the Star's Setting in the Morning	05	. 00

In like manner the Rising and Setting of any Star, whose Declination exceedeth not the Sun's greatest) may be found in any Latitude, from the Equinoctial to 60 Degrees, either North or South Latitude.

A S T R O N O M I C A L T A B L E S, S H E W I N G

The Point of the Compass that the Sun and Stars Rise and Set with.

Being of excellent Use for the ready finding of the Variation of the Compass; and may be performed by an ordinary Meridian-Compass, but more exactly by an Azimuth-Compass.

Fitting all Parts of the World, where the Pole is elevated not above 60 Degrees, either North, or South.

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Latitude 0 Degrees.

North De- clination.		Decl- nation	South De- clination.	
Ori.	Set.		Ori.	Set.
East	West	O. O	East	West
1	2.49		1	
2	5.37		2	
3	8.26		3	
e by n w by n 11.15			e by s w by s	
1	14.4		1	
2	16.52		2	
3	19.41		3	
e n e w n w 22.30			e s e w s w	

Latitude 1 Degree.

North De- clination.		Decl- nation	South De- clination.	
Ori.	Set.		Ori.	Set.
East	West	O. O	East	West
1	2.49		1	
2	5.37		2	
3	8.26		3	
e by n w by n 11.15			e by s w by s	
1	14.4		1	
2	16.52		2	
3	19.41		3	
e n e w n w 22.30			e s e w s w	

Latitude 2 Degrees.

North De- clination.		Decl- nation	South De- clination.	
Ori.	Set.		Ori.	Set.
East	West	O. O	East	West
1	2.49		1	
2	5.37		2	
3	8.26		3	
e by n w by n 11.14			e by s w by s	
1	14.3		1	
2	16.51		2	
3	19.40		3	
e n e w n w 22.29			e s e w s w	

Latitude 3 Degrees.

North De- clination.		Decl- nation	South De- clination.	
Ori.	Set.		Ori.	Set.
East	West	O. O	East	West
1	2.49		1	
2	5.37		2	
3	8.25		3	
e by n w by n 11.14			e by s w by s	
1	14.3		1	
2	16.51		2	
3	19.39		3	
e n e w n w 22.27			e s e w s w	

Latitude 4 Degrees.						Latitude 5 Degree.					
North De- clination.		Decli- nation	South De- clination.			North De- clination.		Decli- nation	South De- clination.		
⊙ri.	⊙set.	D M	⊙ri.	⊙set.		⊙ri.	⊙set.	D M	⊙ri.	⊙set.	
East	West	o. o	East	West		East	West	o. o	East	West	
1		2.48	1			1		2.48		1	
2		5.37	2			2		5.27		2	
3		8.25	3			3		8.24		3	
e by n w by n		11.14	e by s w by s			e by n w by n		11.12	e by s w by s		
1		14.02	1			1		14.01		1	
2		16.50	2			2		16.9		2	
3		19.38	3			3		19.36		3	
e new n w		22.26	e se w s w			e ne w n w		22.23	e se w s w		

Latitude 6 Degrees.						Latitude 7 Degrees					
North De- clination.		Decli- nation	South De- clination.			North De- clination.		Decli- nation	South De- clination.		
⊙ri.	⊙set.	D M	⊙ri.	⊙set.		⊙ri.	⊙set.	D M	⊙ri.	⊙set.	
East	West	o. o	East	West		East	West	o. o	East	West	
1		2.48	1			1		2.48		1	
2		5.36	2			2		5.35		2	
3		8.23	3			3		8.20		3	
e by n w by n		11.11	e by s w by s			e by n w by n		11.9	e by s w by s		
1		13.59	1			1		13.58		1	
2		16.47	2			2		16.45		2	
3		19.23	3			3		19.31		3	
e ne w n w		22.21	e se w s w			e new n w		22.19	e se w s w		

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Latitude 8 Degrees.

North De- clination.		Declination		South De- clination.	
◉ri.	◉set.	D	M	◉ri.	◉set.
East	West	◉.	◉.	East	West
1		2.47		1	
2		5.35		2	
3		8.18		3	
ebyn w by n		11.	8	e bys w bys	
1		13.56		1	
2		16.43		2	
3		19.28		3	
ene w n w		22.15		ese w s w	

Latitude 9 Degrees.

North De- clination.		Declination		South De- clination.	
◉ri.	◉set.	D	M	◉ri.	◉set.
East	West	◉.	◉.	East	West
1		2.47		1	
2		5.34		2	
3		8.17		3	
ebyn w by n		11.	6	e bys w by s	
1		13.53		1	
2		16.40		2	
3		19.25		3	
ene w n w		22.12		ese w s w	

Latitude 10 Degrees.

North De- clination.		Declination		South De- clination.	
◉ri.	◉set.	D	M	◉ri.	◉set.
East	West	◉.	◉.	East	West
1		2.47		1	
2		5.33		2	
3		8.16		3	
ebyn w by n		11.	5	e bys w by s	
1		13.51		1	
2		16.37		2	
3		19.21		3	
ene w n w		22.7		ese w s w	

Latitude 11 Degrees.

North De- clination.		Declination		South De- clination.	
◉ri.	◉set.	D	M	◉ri.	◉set.
East	West	◉.	◉.	East	West
1		2.46		1	
2		5.31		2	
3		8.14		3	
ebyn w by n		11.	3	e bys w by s	
1		13.48		1	
2		16.33		2	
3		19.18		3	
ene w n w		22.3		ese w s w	

Latitude 12 Degrees.

North Declination		Declination	South Declination	
Ori.	Ofet.	D M	Ori.	Ofet.
East	West	0. 0	East	West
1		2.45	1	
2		5.30	2	
3		8.12	3	
e by n w by n		11. 0	e by s w by s	
1		13.45	1	
2		16.30	2	
3		19.14	3	
e n e w n w		21.53	e s e w s w	

Latitude 13 Degrees.

North Declination		Declination	South Declination	
Ori.	Ofet.	D M	Ori.	Ofet.
East	West	0. 0	East	West
1		2.45	1	
2		5.29	2	
3		8.10	3	
e by n w by n		11.57	e by s w by s	
1		13.42	1	
2		16.26	2	
3		19. 9	3	
e n e w n w		21.53	e s e w s w	

Latitude 14 Degrees.

North Declination		Declination	South Declination	
Ori.	Ofet.	D M	Ori.	Ofet.
East	West	0. 0	East	West
1		2.44	1	
2		5.28	2	
3		8. 8	3	
e by n w by n		10.55	e by s w by s	
1		13.38	1	
2		16.22	2	
3		19. 4	3	
e n e w n w		21.47	e s e w s w	

Latitude 15 Degrees.

North Declination		Declination	South Declination	
Ori.	Ofet.	D M	Ori.	Ofet.
East	West	0. 0	East	West
1		2.43	1	
2		5.26	2	
3		8. 6	3	
e by n w by n		10.52	e by s w by s	
1		13.35	1	
2		16.17	2	
3		18.59	3	
e n e w n w		21.41	e s e w s w	

Latitude 16 Degrees.

North De- clination.		Decli- nation.		South De- clination.	
Ori.	Set.	D	M	Ori.	Set.
East	West	O.	O.	East	West
1		2.42		1	
2		5.25		2	
3		8.3		3	
e by n w by n		10.49		e by s w by s	
1		13.31		1	
2		16.12		2	
3		18.53		3	
e n e w n w		21.34		e n e w s w	

Latitude 17 Degrees

North De- clination.		Decli- nation.		South De- clination.	
Ori.	Set.	D	M	Ori.	Set.
East	West	O.	O.	East	West
1		2.42		1	
2		5.23		2	
3		8.1		3	
e by n w by n		10.45		e by s w by s	
1		13.26		1	
2		16.8		2	
3		18.47		3	
e n e w n w		21.27		e s e w s w	

Latitude 18 Degrees.

North De- clination.		Decli- nation.		South De- clination.	
Ori.	Set.	D	M	Ori.	Set.
East	West	O.	O.	East	West
1		2.41		1	
2		5.22		2	
3		7.50		3	
e by n w by n		10.42		e by s w by s	
1		13.22		1	
2		16.2		2	
3		18.40		3	
e n e w n w		21.20		e s e w s w	

Latitude 19 Degrees.

North De- clination.		Decli- nation.		South De- clination.	
Ori.	Set.	D	M	Ori.	Set.
East	West	O.	O.	East	West
1		2.40		1	
2		5.20		2	
3		7.56		3	
e by n w by n		10.38		e by s w by s	
1		13.17		1	
2		15.56		2	
3		18.33		3	
e n e w n w		21.13		e s e w s w	

Latitude 20 Degrees.					Latitude 21 Degrees.				
North Declination		Declination	South Declination		North Declination		Declination	South Declination	
Ori.	Ofet.	D M	Ori.	Ofet.	Ori.	Ofet.	D M	Ori.	Ofet.
East	West	O. O	East	West	East	West	O. O	East	West
1		2.39	1		1		2.38	1	
2		5.17	2		2		5.15	2	
3		7.52	3		3		7.50	3	
e by n w by n		10.34	e by s w by s		e by n w by n		10.30	e by s w by s	
1		13.12	1		1		13.7	1	
2		15.51	2		2		15.44	2	
3		18.27	3		3		18.19	3	
e n e w n w		21.5	e s e w s w		e n e w n w		23.55	e s e w s w	
					1		23.32	1	

Latitude 22 Degrees					Latitude 23 Degrees.				
North Declination		Declination	South Declination		North Declination		Declination	South Declination	
Ori.	Ofet.	D M	Ori.	Ofet.	Ori.	Ofet.	D M	Ori.	Ofet.
East	West	O. O	East	West	East	West	O. O	East	West
1		2.37	1		1		2.36	1	
2		5.13	2		2		5.11	2	
3		7.47	3		3		7.43	3	
e by n w by n		10.25	e by s w by s		e by n w by n		10.21	e by s w by s	
1		13.1	1		1		12.56	1	
2		15.38	2		2		15.31	2	
3		18.11	3		3		18.3	3	
e n e w n w		20.46	e s e w s w		e n e w n w		20.37	e s e w s w	
		23.22	1		1		23.11	1	

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Latitude 24 Degrees.

North Declination.		Declination.	South Declination.	
Ori.	Offset.	D M	Ori.	Offset.
East	West	0. 0	East	West
1		2.35	1	
2		5. 9	2	
3		7.39	3	
e by n w by n		10.16	e by s w by s	
1		12.50	1	
2		15.23	2	
3		17.54	3	
e n e w n w		20.28	e s e w s w	
1		23. 0	1	

Latitude 25 Degrees.

North Declination.		Declination.	South Declination.	
Ori.	Offset.	D M	Ori.	Offset.
East	West	0. 0	East	West
1		2.33	1	
2		5. 6	2	
3		7.36	3	
e by n w by n		10.11	e by s w by s	
1		12.43	1	
2		15.16	2	
3		17.46	3	
e n e w n w		20.18	e s e w s w	
1		22.48	1	

Latitude 26 Degrees.

North Declination.		Declination.	South Declination.	
Ori.	Offset.	D M	Ori.	Offset.
East	West	0. 0	East	West
1		2.32	1	
2		5. 4	2	
3		7.32	3	
e by n w by n		10. 6	e by s w by s	
1		12.35	1	
2		15. 8	2	
3		17.37	3	
e n e w n w		20. 7	e s e w s w	
1		22.36	1	

Latitude 27 Degrees.

North Declination.		Declination.	South Declination.	
Ori.	Offset.	D M	Ori.	Offset.
East	West	0. 0	East	West
1		2.31	1	
2		5. 1	2	
3		7.28	3	
e by n w by n		10. 1	e by s w by s	
1		12.30	1	
2		15. 0	2	
3		17.28	3	
e n e w n w		19.56	e s e w s w	
1		22.23	1	

Latitude 28 Degrees.						Latitude 29 Degrees.					
North Declination.		Declination		South Declination.		North Declination.		Declination		South Declination.	
Ori.	Ofset.	D	M	Ori.	Ofset.	Ori.	Ofset.	D	M	Ori.	Ofset.
East	West	0. 0		East	West	East	West	0. 0		East	West
1		2	29	1		1		2	28	1	
2		4	58	2		2		4	55	2	
3		7	24	3		3		7	20	3	
e by n w by n		9	55	e by s w by s		e by n w by n		9	50	e by s w by s	
1		12	24	1		1		12	17	1	
2		14	51	2		2		14	43	2	
3		17	17	3		3		17	7	3	
e n e w n w		19	45	e s e w s w		e n e w n w		19	43	e s e w s w	
1		20	11	1		1		21	58	1	

Calib Silwood

Latitude 30 Degrees						Latitude 31 Degrees					
North Declination.		Declination		South Declination.		North Declination.		Declination		South Declination.	
Ori.	Ofset.	D	M	Ori.	Ofset.	Ori.	Ofset.	D	M	Ori.	Ofset.
East	West	0. 0		East	West	East	West	0. 0		East	West
1		2	27	1		1		2	25	1	
2		4	52	2		2		4	50	2	
3		7	18	3		3		7	3	3	
e by n w by n		9	44	e by s w by s		e by n w by n		9	38	e by s w by s	
1		12	9	1		1		12	01	1	
2		14	34	2		2		14	25	2	
3		16	57	3		3		16	47	3	
e n e w n w		19	21	e s e w s w		e n e w n w		19	9	e s e w s w	
1		21	44	1		1		21	30	1	

Latitude 32 Degrees.

Latitude 33 Degrees.

North Declination.		Declination	South Declination.		North Declination.		Declination	South Declination.	
Ori.	Offset.	D M	Ori.	Offset.	Ori.	Offset.	D M	Ori.	Offset.
East	West	o. o	East	West	East	West	o. o	East	West
1		2.23	1		1		2.22	1	
2		4.46	2		2		4.43	2	
3		7. 8	3		3		7. 4	3	
by n w by n		9.31	e by s w by s		e by n w by n		9.25	e by s w by s	
1		11.54	1		1		11.46	1	
2		14.16	2		2		14. 6	2	
3		16.36	3		3		16.24	3	
e w n w		18.55	e s e w s w		e n e w n w		18.43	e s e w s w	
1		21.16	1		1		21. 1	1	
					2		23.18	2	

Latitude 34 Degrees.

Latitude 35 Degrees.

North Declination.		Declination	South Declination.		North Declination.		Declination	South Declination.	
Ori.	Offset.	D M	Ori.	Offset.	Ori.	Offset.	D M	Ori.	Offset.
East	West	o. o	East	West	East	West	o. o	East	West
1		2.20	1		1		2.18	1	
2		4.40	2		2		4.37	2	
3		6.59	3		3		6.54	3	
by n w by n		9.18	e by s w by s		e by n w by n		9.12	e by s w by s	
1		11.38	1		1		11.29	1	
2		13.56	2		2		13.46	2	
3		16.12	3		3		16. 2	3	
e w n w		18.30	e s e w s w		e n e w n w		18.16	e s e w s w	
1		20.46	1		1		20.30	1	
2		23. 1	2		2		22.43	2	

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Latitude 36 Degrees.

North Declination.		Declination		South Declination.	
Ori.	Set.	D	M	Ori.	Set.
East	West			East	West
1		2.16		1	
2		4.33		2	
3		6.49		3	
e by n	w by n	9.05		e by s	w by s
1		12.21		1	
2		13.35		2	
3		15.49		3	
e n e	w n w	18.2		e s e	w s w
1		20.15		1	
2		22.25		2	

Latitude 37 Degrees.

North Declination.		Declination		South Declination.	
Ori.	Set.	D	M	Ori.	Set.
East	West			East	West
1		2.15		1	
2		4.36		2	
3		6.43		3	
e by n	w by n	8.58		e by s	w by s
1		11.12		1	
2		13.25		2	
3		15.36		3	
e n e	w n w	17.48		e s e	w s w
1		19.58		1	
2		22.7		2	

Latitude 38 Degrees						Latitude 39 Degrees.					
North Declination.		Declination		South Declination.		North Declination.		Declination		South Declination.	
Oriz.	Set.	D	M	Oriz.	Set.	Oriz.	Set.	D	M	Oriz.	Set.
East	West			East	West	East	West			East	West
1		2.13		1		1		2.11		1	
2		4.26		2		2		4.22		2	
3		6.38		3		3		6.32		3	
e by n	w by n	8.56		e by s	w by s	e by n	w by n	8.43		e by s	w by s
1		11.3		1		1		10.53		1	
2		13.14		2		2		13.3		2	
3		15.23		3		3		15.10		3	
e n e	w n w	17.33		e s e	w s w	e n e	w n w	17.18		e s e	w s w
1		19.41		1		1		19.25		1	
2		21.45		2		2		21.30		2	
						3		23.32		3	

rees.
b De-
ation.
©set.
Well
1
2
3
sw by
1
2
3
wsw
1
2
ees.
Decl.
ion.
©set.
Well
1
2
3
wby
1
2
3
ws
1
2
3

Latitude 40 Degrees.

Latitude 41 Degrees.

North De- clination.			South De- clination.			North De- clination.			South De- clination.		
©ri. ©set.		D. M.	©ri. ©set.			©ri. ©set.		D. M.	©ri. ©set.		
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		2. 9	1			1		2. 7	1		
2		4. 19	2			2		4. 15	2		
3		6. 27	3			3		6. 22	3		
e by n w by n		8. 36	e by s w by s			e by n w by n		8. 28	e by s w by s		
1		10. 43	1			1		10. 34	1		
2		12. 51	2			2		12. 40	2		
3		14. 57	3			3		14. 44	3		
e n e w n w		17. 3	e s e w s w			e n e w n w		15. 47	e s e w s w		
1		19. 7	1			1		18. 50	1		
2		21. 10	2			2		20. 51	2		
3		23. 11	3			3		22. 50	3		

Latitude 42 Degrees.

Latitude 43 Degrees.

North De- clination.			South De- clination.			North De- clination.			South De- clination.		
©ri. ©set.		D. M.	©ri. ©set.			©ri. ©set.		D. M.	©ri. ©set.		
East	West	0. 0	East	West		East	West	0. 0	East	West	
1		2. 6	1			1		2. 04	1		
2		4. 11	2			2		4. 7	2		
3		6. 16	3			3		6. 10	3		
e by n w by n		8. 20	e by s w by s			e by n w by n		8. 12	e by s w by s		
1		10. 24	1			1		10. 14	1		
2		12. 28	2			2		12. 16	2		
3		14. 30	3			3		14. 16	3		
e n e w n w		16. 31	e s e w s w			e n e w n w		16. 15	e s e w s w		
1		18. 32	1			1		18. 14	1		
2		20. 31	2			2		20. 10	2		
3		22. 27	3			3		22. 5	3		

Latitude 44 Degrees.

North Declination.		Declination	South Declination.	
Ori.	Set.	D.M.	Ori.	Set.
East	West.	O. O	East	West
1		2. 1	1	
2		4. 3	2	
3		6. 4	3	
e by n w by n		8. 4	e by s w by s	
1		10. 4	1	
2		12. 3	2	
3		14. 1	3	
e n e w n w		15. 59	e s e w s w	
1		17. 54	1	
2		19. 50	2	
3		21. 42	3	
n e b y n w b y w		23. 32	s e b e s w b w	

Latitude 45 Degrees.

North Declination.		Declination	South Declination.	
Ori.	Set.	D.M.	Ori.	Set.
East	West.	O. O	East	West
1		2. 0	1	
2		3. 59	2	
3		5. 57	3	
e by n w by s		7. 56	e by s w by s	
1		9. 54	1	
2		11. 51	2	
3		13. 46	3	
e n e w n w		15. 42	e s e w s w	
1		17. 36	1	
2		19. 30	2	
3		21. 19	3	
n e b e n w b w		23. 8	s e b e s w b w	

Latitude 46 Degrees.

North Declination.		Declination	South Declination.	
Ori.	Set.	D.M.	Ori.	Set.
East	West	O. O	East	West
1		1. 58	1	
2		3. 55	2	
3		5. 51	3	
e by n w by n		7. 47	e by s w by s	
1		9. 43	1	
2		11. 38	2	
3		13. 32	3	
e n e w n w		15. 25	e s e w s w	
1		17. 17	1	
2		19. 7	2	
3		20. 55	3	
n e b e n w b w		22. 42	s e b e s w b w	

Latitude 47 Degrees.

North Declination.		Declination	South Declination.	
Ori.	Set.	D.M.	Ori.	Set.
East	West	O. O	East	West
1		1. 55	1	
2		3. 50	2	
3		5. 45	3	
e by n w by n		7. 39	e by s w by s	
1		9. 33	1	
2		11. 25	2	
3		13. 17	3	
e n e w n w		15. 8	e s e w s w	
1		16. 57	1	
2		18. 46	2	
3		20. 31	3	
n e b e n w b w		22. 16	s e b e s w b w	

Latitude 48 Degrees.

Latitude 49 Degrees.

North Dec.		Decl. South. Dec.		North Dec.		Decl. South. Dec.	
Ori.	Set.	D	M	Ori.	Set.	D	M
East	West.	O. O	East	West.	O. O	East	West
1		1.53	1	1		1.51	1
2		3.46	2	2		3.42	2
3		5.38	3	3		5.31	3
by n w by n		7.30	e by s w by s	by n w by n		7.22	e by s w by s
1		9.22	1	1		9.10	1
2		11.12	2	2		10.59	2
3		13. 1	3	3		12.46	3
ene w n w		14.50	ese w s w	ene w n w		14.38	ese w s w
1		16.38	1	1		16.17	1
2		18.24	2	2		18. 1	2
3		20. 7	3	3		19.42	3
nebe n w b w		21.49	sebe s w b w	nebe n w b w		21.22	sebe s w b w
1		23.29	1	1		23. 1	1

Latitude 50 Degrees.

Latitude 51 Degrees.

East		West		East		West	
O. O	East	West	O. O	East	West	O. O	East
1		1.48	1	1		1.46	1
2		3.37	2	2		3.33	2
3		5.25	3	3		5.18	3
by n w by n		7.12	e by s w by s	by n w by n		7. 4	e by s w by s
1		8.59	1	1		8.48	1
2		10.46	2	2		10.32	2
3		12.30	3	3		12.14	3
ene w n w		14.14	ese w s w	ene w n w		13.56	ese w s w
1		15.57	1	1		15.36	1
2		17.39	2	2		17.16	2
3		19.18	3	3		18.52	3
nebe n w b w		20.55	sebe s w b w	nebe n w b w		20.28	sebe s w b w
1		22.31	1	1		22. 1	1
				2		23.32	2

Latitude 52 Degrees.					Latitude 53 Degrees.				
North Dec.		Decl.		South. Dec.	North Dec.		Decl.		South Dec.
Ori.	Set.	D	M	Ori.	Set.	D	M	Ori.	Set.
East	West.	O.	O.	East	West	East	West	O.	O.
1	1.44			1		1	1.42		1
2	3.28			2		2	3.23		2
3	5.11			3		3	5.4		3
e by n w by n	6.54			e by s w by s	e by n w by n		6.44		e by s w by s
1	8.37			1		1	8.25		1
2	10.18			2		2	10.4		2
3	11.58			3		3	11.41		3
e n e w n w	13.37			e s e w s w	e n e w n w		13.19		e s e w s w
1	15.16			1		1	14.55		1
2	16.52			2		2	16.29		2
3	18.27			3		3	18.1		3
n e b e n w b w	20.0			n e b e s w b w	n e b e n w b w		19.32		n e b e s w b w
1	21.31			1		1	21.1		1
2	23.0			2		2	22.27		2

Latitude 54 Degrees.					Latitude 55 Degrees.				
East		West		O.	East		West		O.
East	West	O.	O.	East	West	O.	O.	East	West
1	1.39			1		1.37		1	
2	3.18			2		3.14		2	
3	4.57			3		4.49		3	
e by n w by n	6.35			e by s w by s	e by n w by n		6.25		e by s w by s
1	8.13			1		8.1		1	
2	9.50			2		9.35		2	
3	11.25			3		11.8		3	
e n e w n w	13.0			e s e w s w	e n e w n w		12.41		e s e w s w
1	14.33			1		14.12		1	
2	16.5			2		15.42		2	
3	17.35			3		17.9		3	
n e b e n w b w	19.3			n e b e s w b w	n e b e n w b w		18.35		n e b e s w b w
1	20.30			1		19.59		1	
2	21.54			2		21.21		2	
3	23.15			3		22.39		3	

The Mariners Compass Rectified.

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Latitude 56 Degrees.

North Dec. Decl.			South Dec.		
Ori.	Set.	D.M.	Ori.	Set.	D.M.
East	West	O. O	East	West	O. O
1	1.34	1	1	1.34	1
2	3. 9	2	2	3. 9	2
3	4.42	3	3	4.42	3
by n w by n	6.16	by s w by s	6.16	by s w by s	6.16
1	7.49	1	1	7.49	1
2	9.21	2	2	9.21	2
3	10.51	3	3	10.51	3
ene w n w	12.22	ene w s w	12.22	ene w s w	12.22
1	13.50	1	1	13.50	1
2	15.18	2	2	15.18	2
3	16.42	3	3	16.42	3
by e n w by w	18. 6	by e s w by w	18. 6	by e s w by w	18. 6
1	19.28	1	1	19.28	1
2	20.47	2	2	20.47	2
3	22. 3	3	3	22. 3	3
ne n w	23.18	se s w	23.18	se s w	23.18

Latitude 57 Degrees.

North Dec. Decl.			South Dec.		
Ori.	Set.	D.M.	Ori.	Set.	D.M.
East	West	O. O	East	West	O. O
1	1.32	1	1	1.32	1
2	3. 4	2	2	3. 4	2
3	4.35	3	3	4.35	3
by n w by s	6. 6	by s w by s	6. 6	by s w by s	6. 6
1	7.36	1	1	7.36	1
2	9. 6	2	2	9. 6	2
3	10.34	3	3	10.34	3
ene w n w	12. 1	ene w s w	12. 1	ene w s w	12. 1
1	13.28	1	1	13.28	1
2	14.53	2	2	14.53	2
3	16.16	3	3	16.16	3
by e n w by w	17.37	by e s w by w	17.37	by e s w by w	17.37
1	18.56	1	1	18.56	1
2	20.13	2	2	20.13	2
3	21.27	3	3	21.27	3
ne n w	22.39	se s w	22.39	se s w	22.39

Latitude 58 Degrees.

East			West		
O.	O.	O.	O.	O.	O.
1	1.30	1	1	1.30	1
2	2.59	2	2	2.59	2
3	4.28	3	3	4.28	3
by n w by n	5.56	by s w by s	5.56	by s w by s	5.56
1	7.24	1	1	7.24	1
2	8.51	2	2	8.51	2
3	10.17	3	3	10.17	3
ene w n w	11.42	ene w s w	11.42	ene w s w	11.42
1	13.06	1	1	13.06	1
2	14.28	2	2	14.28	2
3	15.48	3	3	15.48	3
by e n w by w	17.07	by e s w by w	17.07	by e s w by w	17.07
1	18.24	1	1	18.24	1
2	19.38	2	2	19.38	2
3	20.50	3	3	20.50	3
ne n w	22.00	se s w	22.00	se s w	22.00
1	23.08	1	1	23.08	1

Latitude 59 Degrees.

East			West		
O.	O.	O.	O.	O.	O.
1	1.27	1	1	1.27	1
2	2.54	2	2	2.54	2
3	4.20	3	3	4.20	3
by n w by n	5.46	by s w by s	5.46	by s w by s	5.46
1	7.11	1	1	7.11	1
2	8.36	2	2	8.36	2
3	10. 0	3	3	10. 0	3
ene w n w	11.22	ene w s w	11.22	ene w s w	11.22
1	12.42	1	1	12.42	1
2	14. 3	2	2	14. 3	2
3	15.21	3	3	15.21	3
by e n w by w	16.37	by e s w by w	16.37	by e s w by w	16.37
1	17.52	1	1	17.52	1
2	19. 4	2	2	19. 4	2
3	20.14	3	3	20.14	3
ne n w	21.22	se s w	21.22	se s w	21.22
1	22.26	1	1	22.26	1
2	23.27	2	2	23.27	2

Latitude 60 Degrees.

North Declination.			South Declination.		
☉ rise.	D.M.	☉ set.	☉ rise.	D.M.	☉ set.
East.	0. 0	West.	East.	0. 0	West.
1	1.25	1	1	1.25	1
2	2.49	2	2	2.49	2
3	4.12	3	3	4.12	3
e by n	5.36	w by n	e by s	5.36	w by s
1	6.59	1	1	6.59	1
2	8.21	2	2	8.21	2
3	9.42	3	3	9.42	3
e n e	11. 2	w n w	e s e	11. 2	w s w
1	12.21	1	1	12.21	1
2	13.38	2	2	13.38	2
3	14.53	3	3	14.52	3
ne by e	16. 8	nw by w	se by e	16. 8	sw by w
1	17.20	1	1	17.20	1
2	18.30	2	2	18.30	2
3	19.38	3	3	19.38	3
n e	20.42	n w	s e	20.42	s w
1	21.45	1	1	21.45	1
2	22.44	2	2	22.44	2

The Description and Use of the foregoing Tables.

1. **T**Hese Tables of Points of the Compass, at which the Sun, or any Star, (whose Declination exceeds not 23d. 30 m.) begin at Latitude 0 Degrees, and proceeding orderly to 60 Degrees (being some 4, some 5, and some 6 in one Page) and 61 in all.

2. In each Table are 5 Columns, the middle-most contains the Degrees of Declination, either North, or South, those 2 on the Left-hand of it is ☉ ri. | ☉ su. (under

North

North Declination) stands for Sun-Rising, and Sun-Setting; and on the Right-hand is the like under South-Declination.

3. The first and second Columns (under North Declination) as also the fourth and fifth Col. (under South Declination) contains the Points, and each Quarter of a Point of the Compass, of both Rising and Setting: Thus, East-West under which is 1, 2, 3; that is, East or West, 1 Quarter, 2 Quarters, 3 Quarters Northerly, or Southerly; then E. by N. W. by N. under which is 1, 2, 3, that is, E. by N. or W. and by N, 1 Quarter, 2 Quarters Northerly, &c:

These Tables are ready Helps to find the Variation of the Compass, with ease and sufficient exactness; evidently made out in the following Uses.

To find the Point of the Compass that the Sun Riseth, or Sets at in any Time of the Year.

First seek the Sun's Declination in the Table of Declination, for the Time proposed; with which, enter the foregoing Table, finding the Latitude in the Head of the Table, and the Declination in the third Column; against which, on the Left-hand, if it be North Declination, but on the Right-hand, if it be South Declination, is the Point of the Compass that the Sun Rises or Sets at; according to the Titles at the head of the Table.

Note, These Tables shew the true Points of the Sun's Rising or Setting; so that you may readily know at any Time, seeing the Sun Rise, or Set; the Variation by an ordinary Meridian Compass.

There are some Compasses not touched so well as they ought to be; others, in Time, the Virtue of the Stone wears off from the Needle.

Now, by these foregoing Tables, you may very readily discover any of these Defects.

But it may be objected, they cannot set the Sun by an ordinary Meridian Compass, so near as is required.

To this I answer, it's as easy to set the Sun by the Compass, as to steer a Ship by it: For expert Sea men can set the Sun, or a Head-land, to near a Quarter of a Point, by their Hand, (but with Sights, much nearer the Truth.) The Posture to observe in such a Case, I advise is thus;

Set the Compass about two Foot high; and directing your Hand towards the Sun, note what *Point, Half Point, or Quarter Point*, the Sun Riseth, or Setteth on; then, in that Table belonging to the Latitude, see whether the Sun Riseth, or sets that Day upon the same Point, found by Observation: If they agree, there is no Variation; but if they do not agree, the Compass is not True, or there is Variation; and the Variation is so much as is the Difference between the Observation and the Table.

Example 1. Admit in Latitude 30 Degrees North, the Sun having 9 Degrees 44 Minutes North Declination; I observe the Sun that Day to Rise upon the E. N. E. Point of the Compass: I demand the Variation.

In the Head of the foregoing Tables, look for the Latitude 30 Degrees; and in the Third Column for 9 deg. 44m. North Declination; against it (under ☉ rise) is E. by N. which sheweth that there is one Point Variation. For it appears by the Table, that the E. N. E. Point on the Compass, is the true E. by N. Point; and the E. by N. (as it's upon the Compass) is the true East Point; the East Point is the true E. by S. the S. E. is the S. E. by S. and the South is the S. by W. the West is the W. by N. and the North is the N. by E.

This plainly appears by the Rectifier, if you bring the E. by N. on the outward Circle, to touch the E. N. E. on the inward Circle.

Now, suppose we were to observe the Sun at his Setting, in the Latitude of 30 deg. with Declination 9 deg. 44m. North as abovesaid, we should find the Sun to set exactly at West by the Compass, altho' in the

Morning

Morning we did find the Sun to Rise at E. N. E. I know this will be little less than a Contradiction to some, but if you cast your Eye upon the *Rectifier*, you may see it's certain Truth.

Example 2. In Latitude 37 deg. North, the Sun's Declination 8 deg. 58 min. North. I observe the Sun to Rise E. by N. by the Compass, I demand the Variation? In the Table that belongs to 37 deg. against 8 deg. 58 min. North Declination (and under ☉ *Rise*) is E. by N. which sheweth (seeing the Observation doth agree with the Table) there is no Variation.

Nota, If the Declination for the Day proposed be not the same with the Declination in the Tables, then have regard to the nearest, allowing for the Difference.

Example 3. In Latitude 37 deg. North, suppose the Sun's Declination 10 deg. 15 min North, I demand the Point of the Compass that the Sun should Rise with?

In the Table the nearest to 10 deg. 15 min. is 11 d. 1 min. against which the Sun Riseth E. by N. $\frac{1}{4}$ N. and sets W. by N. $\frac{1}{4}$ N. but (in the Table for 37 deg. Latitude) because the Declination proposed, is near about the middle between 8 d. 48 m. and 11 d. 12 m. therefore the Sun Riseth E. by N. Half a Quarter N. and Setteth W. by N. Half a Quarter N.

Understand the like in any other Case, let the Declination be what it will, in any other Latitude.

Example 4. Admit in Latitude 38 d. 20 m. North, Declination 19 d. 30 m. South. The Sun Riseth on the E. S. E. Point of the Compass; I demand the Variation?

In the Table for Latitude 38 deg. and against 19 D. 30 m. (the nearest to the given Declination) is E. S. E. a Quarter S. which sheweth, that there is a Quarter of a Point Variation: For the E. S. E. Point is E. S. E. $\frac{1}{4}$ S. the North Point is N. $\frac{1}{4}$ E: For if you do bring S. E. $\frac{1}{4}$ S. on the outward Circle of the *Rectifier*, to which E. S. E. on the inward Circle, then S. S. W. on the

Compass is S. S. W. $\frac{1}{2}$ W, and S. E. is S. E. $\frac{1}{4}$ S. and East is East $\frac{1}{2}$ S. and so for any other Point, Half-point or Quarter-point, by casting your Eye upon the Rectifier.

Note. The Tables shew the true Points of Rising and Setting, and the outward Circle on the Rectifier doth the same: But the Compass, when it differeth from the Tables, sheweth a false Point; and the inward Circle on the Rectifier doth the same.

Example 5. Admit in Latitude 47d. 24m. North, the Declination 15d. 2m. South, the Sun Rising E. by S. by the Compass; I demand the Variation?

By the Tables the Sun should Rise E. S. E. therefore there is one Point Variation: for if you bring the E. S. E. on the outward Circle of the Rectifier, to touch the E. by S. on the inward Circle, then the N. by W. on the Compass, is the true North Point; the N. W. is the N. W. by N. and the South by E. is the true South Point.

By this time, I suppose my Reader able to discover how much the Variation is, and how to reckon it, without any Geometrical Demonstration, or Arithmetical Calculation.

Note. If you have any odd minutes of Latitude, go to that Table nearest the Latitude you are in.

I come now to resolve a Question some are puzzled with, and that is this:

Question. If the Sun Rise at E. N. E. in any Latitude, should he not Set the same Day at W. N. W. in the same Latitude?

Answer. If there be no Variation, it will; but if there be Variation, it will not be so: The reason is evident on the Rectifier.

By these Tables you may know the Point of the Compass that any of the Stars do Rise and Set at, in any Latitude (the Tables contain) either North or South, the true Declination do not exceed the Sun's greatest Declination.

Example 6. Let it be required to find the Point of the Compass that any of the Stars do Rise and Set at, in any Latitude.

Compass the *Bull's Eye* Riseth and Sets with, in the Latitude of 50 Degrees North?

The Declination of this Star is 15 d. 50m. North, in the Table that belongs to 50 d. against 15 deg. 57 m. North Declination, the Point of Rising is E.N.E. $\frac{1}{4}$ N. and the Point of Setting is W.N.W. $\frac{1}{4}$ N.

Understand the like for any other Star, whose Declination exceeds not the Sun's greatest Declination.

The Use of the Rectifier.

THIS Instrument, as before described (in Page 93, 94, and 95) containeth two Circles or Compasses, one within the other; but as it's made in Wood, the one moveth upon the other, and by it the Compass when it doth vary, may be Rectified as followeth:

Bring the true Point of Rising, or Setting (as the Table sheweth) on the Outward or Under Compass, to touch the false Point of Rising or Setting (as your Compass sheweth) on the Inward or Upper Compass, then will the Under Compass rectify the Upper.

Exa. 7. Admit in Lat. 45 d. N. the Sun's Declination being 7 d. 56m. South, the Sun Setting upon the W. by N. Point of the Compass: I demand the Variation?

The Sun (if there be no Variation) will Set at W. by S. and Rise at E. by S. as the Table sheweth, therefore it appears there is two Points Variation.

Bring the W. by S. Point on the outward Compass, to touch the W. by N. Point on the inward Compass: Then the Points upon the outward Compass, do explain the Points that are upon the inward: So that according to the foregoing Observation, the N.N.E. Point on the Compass, is the true North; the North is the true NNW. the W. by N. is the true W. by S. the S. E. by E. is the true E. by S; and so for any other Point of the Compass, by only looking on the Rectifier.

And thus you may Rectify the Compass, without reckoning which way the Variation is, either Eastward, or Westward; the Rectifier doth that so plain, that you can't be mistaken.

A Table of Amplitudes, fitting all Places from the Equinoctial, to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Decl.	1		2		3		4		5		6	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	00	01	00	01	00	01	00	01	00	01	00
2	02	00	02	00	02	00	02	00	02	00	02	00
3	03	00	03	00	03	00	03	00	03	00	03	00
4	04	00	04	00	04	00	04	00	04	00	04	00
5	05	00	05	00	05	00	05	00	05	00	05	00
6	06	00	06	00	06	00	06	00	06	00	06	00
7	07	00	07	00	07	00	07	00	07	00	07	00
8	08	00	08	00	08	00	08	00	08	00	08	00
9	09	00	09	00	09	00	09	00	09	00	09	00
10	10	00	10	00	10	00	10	00	10	00	10	00
11	11	00	11	00	11	00	11	00	11	00	11	00
12	12	00	12	00	12	00	12	00	12	00	12	00
13	13	00	13	00	13	00	13	00	13	00	13	00
14	14	00	14	00	14	00	14	00	14	00	14	00
15	15	00	15	00	15	00	15	00	15	00	15	00
16	16	00	16	00	16	00	16	00	16	00	16	00
17	17	00	17	00	17	00	17	00	17	00	17	00
18	18	00	18	00	18	00	18	00	18	00	18	00
19	19	00	19	00	19	00	19	00	19	00	19	00
20	20	00	20	00	20	00	20	00	20	00	20	00
21	21	00	21	00	21	00	21	00	21	00	21	00
22	22	00	22	00	22	00	22	00	22	00	22	00
23	23	00	23	00	23	00	23	00	23	00	23	00
23 31	23	31	23	31	23	31	23	31	23	31	23	31

Degrees of Declination

Decl.

Degrees of Latitude.

*A Table of Amplitudes, fitting all Places from the Equino-
dial to 60 Degrees of Latitude, either North or South.*

The Degrees of Latitude.

Sun's Decl.	7		8		9		10		11		12	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	0	00	0	00	0	00	0	00	0	00	0
1	01	0	01	0	01	0	01	1	01	1	01	1
2	02	1	02	1	02	1	02	2	02	2	02	3
3	03	1	03	1	03	1	03	3	03	3	03	4
4	04	2	04	2	04	2	04	4	04	4	04	5
5	05	2	05	2	05	3	05	5	05	5	05	7
6	06	2	06	3	06	4	06	6	06	6	06	8
7	07	3	07	4	07	5	07	7	07	8	07	9
8	08	3	08	4	08	6	08	8	08	9	08	11
9	09	4	09	5	09	6	09	9	09	10	09	12
10	10	4	10	6	10	7	10	10	10	11	10	13
11	11	5	11	6	11	8	11	11	11	13	11	15
12	12	5	12	7	12	9	12	12	12	14	12	16
13	13	6	13	8	13	9	13	13	13	15	13	17
14	14	6	14	8	14	10	14	14	14	16	14	19
15	15	7	15	9	15	11	15	15	15	17	15	20
16	16	7	16	10	16	12	16	16	16	19	16	22
17	17	8	17	10	17	13	17	17	17	20	17	23
18	18	8	18	11	18	14	18	18	18	21	18	25
19	19	9	19	12	19	15	19	19	19	22	19	26
20	20	9	20	12	20	16	20	20	20	24	20	28
21	21	10	21	13	21	17	21	21	21	25	21	29
22	22	10	22	13	22	18	22	22	22	27	22	31
23	23	11	23	14	23	19	23	23	23	28	23	33
23, 31	23	42	23	46	23	50	23	54	23	59	24	05

Degrees of Latitude.

*A Table of Amplitudes, fitting all Places from the Equino-
xial to 60 Degrees of Latitude, either North or South.*

The Degrees of Latitude.

Sun's Decl.	13		14		15		16		17		18	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	00	00	00	0	00	00	00	00	00	0	00
1	01	20	01	20	2	01	20	01	20	2	01	20
2	02	30	02	30	4	02	50	02	50	5	02	50
3	03	50	03	50	6	03	70	03	70	8	03	70
4	04	60	04	70	8	04	10	04	11	10	04	12
5	05	80	05	90	10	05	12	05	13	12	05	15
6	06	10	06	11	13	06	15	06	17	15	06	19
7	07	11	07	13	15	07	17	07	19	17	07	22
8	08	13	08	15	17	08	19	08	22	19	08	25
9	09	14	09	17	19	09	21	09	25	21	09	28
10	10	16	10	19	21	10	24	10	28	24	10	31
11	11	17	11	20	23	11	27	11	30	27	11	34
12	12	19	12	22	25	12	29	12	33	29	12	38
13	13	20	13	24	27	13	32	13	36	32	13	41
14	14	22	14	26	30	14	34	14	39	34	14	44
15	15	24	15	28	32	15	37	15	42	37	15	47
16	16	26	16	30	35	16	40	16	45	40	16	51
17	17	28	17	32	37	17	42	17	48	42	17	54
18	18	30	18	34	39	18	45	18	51	45	18	58
19	19	31	19	36	42	19	48	19	54	48	19	59
20	20	33	20	38	44	20	51	21	57	51	21	04
21	21	35	21	40	46	21	53	22	00	53	22	08
22	22	37	22	43	49	22	56	23	04	56	23	12
23	23	39	23	45	51	23	58	24	06	58	24	15
23, 31	24	41	24	47	54	24	32	25	40	32	25	49

A Table of Amplitudes, fitting all Places from the Equino-
 tial, to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Decl.	19		20		21		22		23		24	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	00	00	00	00	00	00	00	00	00	00	00
3	01	03	01	04	01	04	01	05	01	05	01	06
6	02	07	02	08	02	08	02	09	02	10	02	12
9	03	10	03	12	03	13	03	14	03	15	03	17
12	04	14	04	16	04	17	04	19	04	21	04	23
15	05	17	05	19	05	21	05	23	05	26	05	28
19	06	21	06	23	06	26	06	28	06	31	06	34
22	07	24	07	27	07	30	07	33	07	37	07	40
25	08	28	08	31	08	34	08	38	08	42	08	46
28	09	31	09	35	09	39	09	43	09	47	09	51
31	10	35	10	39	10	43	10	48	10	52	10	57
34	11	38	11	43	11	48	11	53	11	58	12	03
38	12	42	12	47	12	52	12	58	13	03	13	09
41	13	46	13	51	13	57	14	03	14	09	14	15
44	14	50	14	55	15	01	15	08	15	14	15	21
47	15	53	16	00	16	06	16	13	16	20	16	27
51	16	57	17	04	17	11	17	18	17	26	17	34
54	17	01	18	08	18	15	18	23	18	31	18	40
58	18	05	19	12	19	20	19	28	19	37	19	46
1	19	09	20	16	20	24	20	33	20	42	20	52
04	20	12	21	20	21	29	21	39	21	49	21	59
08	21	16	22	25	22	34	22	44	22	55	23	07
12	22	20	23	29	23	39	23	50	24	01	24	12
15	23	24	24	34	24	44	24	55	25	07	25	19
19	23	28	25	38	25	48	25	59	25	11	25	24

Degrees of Declination.

A Table of Amplitudes, fitting all Places from the Equino-
 Eial to 60 Degree of Latitude, either North or South.

The Degrees of Latitude.

Decl. Sun's	25		26		27		28		29		30	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	06	01	07	01	08	01	08	01	09	01	09
2	02	12	02	13	02	15	02	16	02	17	02	18
3	03	18	03	20	03	22	03	24	03	26	03	28
4	04	25	04	27	04	29	04	32	04	34	04	37
5	05	31	05	31	05	37	05	40	05	43	05	46
6	06	37	06	41	06	44	06	48	06	52	06	56
7	07	43	07	47	07	51	07	56	08	01	08	06
8	08	50	08	54	08	59	09	04	09	09	09	15
9	09	56	10	01	10	06	10	12	10	18	10	24
10	11	03	11	08	11	14	11	21	11	27	11	34
11	12	09	12	15	12	21	12	28	12	36	12	44
12	13	16	13	28	13	30	13	37	13	45	13	53
13	14	22	14	30	14	37	14	45	14	54	15	03
14	15	29	15	37	15	45	15	54	16	03	16	12
15	15	35	16	44	16	53	17	03	17	12	17	23
16	16	42	17	51	18	01	18	11	18	21	18	32
17	17	49	18	59	19	09	19	20	19	31	19	43
18	18	56	20	06	20	17	20	29	20	41	20	54
19	21	02	21	13	21	25	21	38	21	51	22	05
20	22	10	22	22	22	34	22	48	23	02	23	16
21	23	18	23	30	23	43	23	57	24	12	24	27
22	24	24	24	37	24	51	25	06	25	22	25	38
23	25	32	25	46	26	01	26	16	26	32	26	49
23	31	26	08	26	23	26	29	26	46	27	03	27

Degrees of Declination.

Degrees of Declination.

A Table of Amplitudes, fitting all Places from the Equinoctial
to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Dec.	31		32		33		34		35		36	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	0	00	0	00	0	00	0	00	0	00	0
1	01	10	01	10	01	11	01	12	01	13	01	14
2	02	19	02	21	02	23	02	25	02	27	02	29
3	03	30	03	33	03	35	03	38	03	40	03	43
4	04	40	04	43	4	46	04	50	04	53	04	57
5	05	50	05	54	05	58	06	02	06	6	06	11
6	07	0	07	5	07	10	07	14	07	20	07	25
7	08	11	08	16	08	21	08	27	08	31	08	40
8	09	21	09	27	09	33	09	39	09	46	09	54
9	10	31	10	38	10	45	10	52	11	0	11	08
10	11	41	11	48	11	55	12	03	12	12	12	21
11	12	52	13	0	13	9	13	18	13	28	13	39
12	14	2	14	11	14	21	14	32	14	43	14	54
13	15	13	15	23	15	33	15	44	15	56	16	9
14	16	22	16	33	16	45	16	57	17	10	17	24
15	17	34	17	46	17	58	18	11	18	25	18	40
16	18	44	18	57	19	11	19	25	19	40	19	55
17	19	56	20	10	20	24	20	39	20	55	21	11
18	21	7	21	21	21	36	21	53	22	10	22	27
19	22	19	22	34	22	50	23	07	23	25	23	44
20	23	31	23	47	24	4	24	22	24	41	25	0
21	24	43	25	0	25	18	25	37	25	56	26	17
22	25	55	26	13	26	32	26	52	27	13	27	35
23	27	7	27	26	27	46	28	7	28	29	28	52
24	27	40	28	0	28	21	28	43	29	7	29	31

Degrees of Declination.

A Table of Amplitudes, fitting all Places from the Equino-
 xial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Decl.	37		38		39		40		41		42	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	15	01	16	01	17	01	18	01	20	01	21
2	02	30	02	32	02	34	02	36	02	39	02	41
3	03	45	03	48	03	51	03	54	03	58	04	02
4	05	00	05	04	05	08	05	13	05	18	05	23
5	06	16	06	21	06	26	06	32	06	38	06	44
6	07	31	07	37	07	43	07	50	07	57	08	05
7	08	47	08	54	09	01	09	09	09	17	09	26
8	10	02	10	10	10	19	10	28	10	37	10	47
9	11	17	11	27	11	37	11	47	11	58	12	09
10	12	32	12	43	12	54	13	06	13	18	13	31
11	13	50	14	01	14	13	14	26	14	39	14	53
12	15	06	15	18	15	31	15	45	16	00	16	15
13	16	22	16	35	16	49	17	04	17	20	17	37
14	17	38	17	52	18	08	18	24	18	42	19	00
15	18	55	19	11	19	28	19	45	20	04	20	23
16	20	11	20	28	20	46	21	05	21	25	21	46
17	21	28	21	46	22	06	22	26	22	48	23	10
18	22	46	23	05	23	25	23	47	24	10	24	34
19	24	04	24	24	24	46	25	09	25	33	25	58
20	25	21	25	43	26	06	26	30	26	56	27	24
21	26	39	27	02	27	27	27	53	28	21	28	50
22	27	58	28	23	28	49	29	16	29	45	30	16
23	29	17	29	43	30	11	30	40	31	11	31	43
24	31	29	30	57	30	24	31	22	31	54	32	28

Degrees of Declination.

The Mariners Compass Rectified.

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A Table of Amplitudes, fitting all Places from the Equinoctial
to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Decl.	M.	43		44		45		46		47		48	
		D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
00	0	00	00	00	00	00	00	00	00	00	00	00	00
21	1	01	22	01	23	01	25	01	26	01	28	01	29
41	2	03	44	02	47	02	50	02	53	02	56	02	59
02	3	04	06	04	10	04	15	04	19	04	24	04	29
23	4	05	28	05	34	05	40	05	46	05	52	05	59
44	5	06	51	06	58	07	05	07	12	07	20	07	29
05	6	08	13	08	21	08	30	08	39	08	49	08	59
26	7	09	35	09	45	09	56	10	06	10	18	10	30
47	8	10	58	11	09	11	21	11	34	11	47	12	00
09	9	12	21	12	34	12	47	13	01	13	16	13	31
31	10	13	44	13	58	14	13	14	28	14	44	15	02
53	11	15	07	15	22	15	38	15	56	16	15	16	34
15	12	16	31	16	48	17	06	17	25	17	45	18	06
37	13	17	55	18	13	18	33	18	54	19	16	19	39
00	14	19	18	19	39	20	00	20	23	20	47	21	12
23	15	20	43	21	05	21	28	21	52	22	18	22	45
46	16	22	08	22	32	22	56	23	23	23	50	24	20
10	17	23	34	23	59	24	25	24	53	25	23	25	55
34	18	24	59	25	26	25	54	26	25	26	57	27	31
58	19	26	25	26	54	27	25	27	58	28	32	29	07
24	20	27	53	28	23	28	56	29	31	30	07	30	45
50	21	29	20	29	53	30	27	31	03	31	42	32	23
16	22	30	48	31	22	31	58	32	37	33	18	34	03
43	23	32	16	32	51	33	30	34	12	34	56	35	43
8	23.31	33	02	33	40	34	20	35	03	35	48	36	35

*A Table of Amplitudes, fitting all Places from the Equino-
tial to 60 Degrees of Latitude, either North or South.*

The Degrees of Latitude.

Sun's Decl.	49		50		51		52		53		54	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	31	01	33	01	35	01	37	01	39	01	42
2	03	03	03	06	03	10	03	13	03	20	03	24
3	04	34	04	40	04	46	04	52	04	59	05	06
4	06	06	06	14	06	22	06	30	06	39	06	49
5	07	38	07	48	07	58	08	08	08	19	08	31
6	09	10	09	21	09	33	09	46	10	00	10	14
7	10	42	10	55	11	09	11	24	11	40	11	57
8	12	14	12	29	12	45	13	02	13	21	13	41
9	13	47	14	05	14	24	14	43	15	04	15	26
10	15	21	15	40	16	01	16	23	16	46	17	11
11	16	54	17	16	17	39	18	03	18	29	18	51
12	18	28	18	52	19	18	19	44	20	12	20	47
13	20	03	20	29	20	57	21	26	21	57	22	30
14	21	38	22	06	22	37	23	08	23	42	24	18
15	23	14	23	45	24	18	24	52	25	28	26	07
16	24	51	25	24	25	59	26	36	27	16	27	58
17	26	28	27	03	27	41	28	21	29	04	29	50
18	28	06	28	43	29	24	30	07	30	53	31	42
19	29	45	30	25	31	08	31	55	32	45	33	38
20	31	25	32	08	32	54	33	46	34	39	35	34
21	33	06	33	52	34	41	35	34	36	31	37	32
22	34	48	35	37	36	30	37	27	38	29	39	30
23	36	33	37	26	38	23	39	24	40	29	41	40
24	38	13	38	20	39	19	40	23	41	32	42	46

Degrees of Latitude.

*A Table of Amplitudes, fitting all Places from the Equino-
dial to 60 Degrees of Latitude, either North or South.*

The Degrees of Latitude.

Sun's Decl.	55		56		57		58		59		60	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
00	00	00	00	00	00	00	00	00	00	00	00	00
01	01	45	01	47	01	50	01	53	01	56	02	00
02	03	29	03	34	03	40	03	46	03	53	04	00
03	05	14	05	22	05	31	05	40	05	50	06	00
04	06	59	07	10	07	22	07	34	07	47	08	01
05	08	44	08	57	09	11	09	26	09	43	10	02
06	10	30	10	47	11	04	11	22	11	42	12	04
07	12	15	12	35	12	56	13	18	13	41	14	06
08	14	02	14	24	14	48	15	14	15	41	16	10
09	15	49	16	14	16	41	17	10	17	41	18	14
10	17	37	18	05	18	35	19	07	19	41	20	18
11	19	26	19	56	20	29	21	04	21	43	22	26
12	21	15	21	49	22	25	23	04	23	47	24	34
13	23	05	23	43	24	23	25	07	25	54	26	45
14	24	56	25	37	26	21	27	09	28	01	28	56
15	26	49	27	34	28	22	29	14	30	10	31	10
16	28	43	29	32	30	24	31	21	32	22	33	27
17	30	39	31	31	32	27	33	28	34	32	35	47
18	32	35	33	33	34	34	35	40	36	52	38	10
19	34	35	35	36	36	43	37	54	39	13	40	37
20	36	36	37	42	38	53	40	12	41	37	43	10
21	38	39	39	51	41	09	42	34	44	05	45	47
22	40	47	42	04	43	27	44	59	46	40	48	32
23	42	56	44	19	45	50	47	30	49	21	51	24
24	44	06	45	32	47	05	48	49	50	44	52	53

The Use of this Table of Amplitudes.

THE *Amplitude*, is the Distance of Rising, or Setting the Sun or Star from the East or West Points of the Horizon.

And Note, The Sun or Star having North Declination they Rise to the Northward of the East, and Set to the Northward of the West: But if their Declination be South, they Rise to the Southward of the East and Set to the Southward of the West: And by these Tables thus found:

Look the Latitude in the Head of the Table, the Declination in the first Column on the Left-Hand, and the common Angle of meeting, is the *Amplitude* desired.

Example 1. In the Latitude of 30 deg. the Sun's Declination being 7d. 0m. North, I demand the *Amplitude*.

Answer. The *Amplitude* is 8d. 6m for under Latitude 30 deg. in Page 140. and against Declination 7 deg. you will find 8 D. 6 M. which is the *Amplitude* from the East-Northward, at Sun Rising, and from the West-Northward, at Sun Setting. But if the Declination had been 7 D. 0 M. South, in Latitude 30 deg. as aforesaid, then the *Amplitude* would have been 8 D. 6 M. from the East-Southward at Sun Rising; and 8 D. 06 M. from the West-Southward, at Sun-setting.

If there be any odd Minutes of Declination, take the Proportional part.

Example 2. In the Latitude of 42 D. 30 M. the Sun's Declination being 12 D. 15 M. I demand the *Amplitude*.

Ans. The *Ampl.* is 16 D. 43 M. found as follows. According to the former Directions for the Latit. of 42 and Decl. being $\left\{ \begin{smallmatrix} 12 \\ 13 \end{smallmatrix} \right\}$ D. the *Ampl.* is $\left\{ \begin{smallmatrix} 16 \text{ D. } 15 \text{ M.} \\ 17 \text{ D. } 37 \text{ M.} \end{smallmatrix} \right\}$

Subtract, and their Difference is 1 D. 22 M.

The

The Mariners Compass Rectified. 147

Then say, As 1 D. or 60 M. is to 1 D. 22 M. or 82 M.
So is 15 M. to 20 M. found as here under:

If 60 M. give ——— 82 M. ——— what shall 15 Min.

$$\begin{array}{r} 15 \\ \hline 410 \\ 82 \end{array}$$

6(0)123(0(20 M. Proportional Part.

0 30 Remainder.

Lat. 42 D. and Declin. 12 D. the Amplit. is 16 D. 15 M.

To it add Proportional Part above ——— 0 D. 20 M.

Gives Amplit. for Declin. 12 D. 15. M. to be 16 D. 35 M.
D. M.

Again, for Lat. 43 D. and Dec. $\left\{ \begin{smallmatrix} 12 \\ 13 \end{smallmatrix} \right\}$ D. Amp. is $\left\{ \begin{smallmatrix} 16.31 \\ 17.55 \end{smallmatrix} \right\}$

Subtracted makes Difference to be ——— 1.24

Then say : As 60 m. is to 1 d. 24 m. or 84 m. so is 15 m.
to 21 m. found as here under :

If 60 m. give ——— 84 m. what shall 15 m.
15

$$\begin{array}{r} 420 \\ 84 \end{array}$$

6(0)126(2(21 m. Proport. Parts

06
00 Remainder.

Lat. 43 d. and Declin. 12 d. Amplitude is ——— 16 31
D. M.

To it add Proportional Part above ——— 0 21

Gives for Declin. 12 d. 15 m. the Amplitude 16 52

Now because the given Latitude 42 d. 30 m. is in the
middle, between 42 d. and 43 d. therefore the Medium
of the Amplitudes before found, is the Amplitude re-
quired, and is thus,

Lat. $\left. \begin{matrix} 42 \\ 43 \end{matrix} \right\}$ D. Decl. 12d. 15m. the *Ampl.* is $\left. \begin{matrix} 16 \\ 16 \end{matrix} \right\}$ 35m. 52m.

Added together, is ————— 33d. 27m.

The half is the *Amplitude* required ————— 16d. 43m.

Thus may the *Amplitude* be found for any odd Minutes of Latitude, or Declination, tho' the Table is calculated for whole *Degrees* only.

By this Table the Variation of the Compass is most readily found; for by the Azimuth-Compass find the Sun, or Stars Magnetical Amplitude, at their Rising or Setting; and the true Amplitude (according to the Latitude of the Place, and their Declination) by this Table the Difference of these Amplitudes (when both are North, or both South), but their Sum (if one North the other South) is the Variation of the Compass.

But by the *Rectifier* its most easily done thus;

Bring the Magnetical Amplitude (on the Upper Compass) right against the true Amplitude (on the lower Compass) then doth the North Point in the upper stand against the Variation in the lower; and the upper Compass is explained in all its Parts by the lower Compass.

Example 1. Suppose the Magnetical Amplitude at Sun Rising (found by the Azimuth Compass) be *East-Southerly* 15d. 30m. and the true Amplitude (according to the Latitude of the Place, and Declination of the Object observed) be *East-Southerly* 26d. 45m. I demand the Variation of the Compass?

R. the Rectifier:

Bring 15d. 30m. *East Southerly* on the Upper Compass, against 26 d. 45m. *East Southerly* on the Lower Compass; then doth the North Point, on the first, stand right against 11 d. 15 m. *North Easterly*, on the latter, so that the Compass doth vary 11d. 15m. or one Point *Eastly*.

Example 2. $\left. \begin{matrix} \text{True} \\ \text{Magnet.} \end{matrix} \right\}$ *Ampl.* $\left. \begin{matrix} 07d. 00m. \text{ East Northerly} \\ 15d. 30m. \text{ East Southerly} \end{matrix} \right\}$

I demand the Variation of the Compass?

The Mariners Compass Rectified.

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By the Rectifier.

Bring 15d. 30m. East Southerly on the Upper Compass, against 7 deg. East Northerly on the Lower Compass, then North, on the first. stands against 22d. 30m. North Westerly; that is, 22d 30m or 2 Points Variation West. In like manner do for any, and the Variation is most readily found.

THIS Rectifier is made in Wood, by James Atkinson at Cherry-Garden Stairs, on Rotherhith Wall; at all sorts of Mathematical Books, and Instruments, are there Sold.

The APPENDIX contains the Description and Use of Instruments most useful in Navigation.

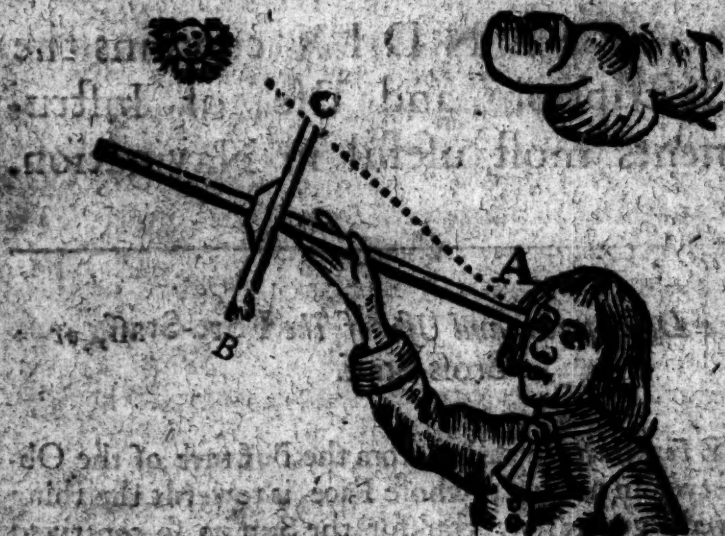
The Description and Use of the Fore-Staff, or Cross-Staff.

THE Fore-staff, so called from the Posture of the Observer in using it, whose Face is towards the thing observed, generally: tho' for the Sun its so contrived (or preserving the Eye) to be used backward: It's called so a Cross-staff from its Form; being a Square Staff with 4 pieces of Wood a-cross it, which are called Crosses.

The Staff is usually about 30 Inches, or 3 Foot long and more than half an Inch square, having 4 sides; each graduated unequally like a *Scale of Tangents*, to each of them belongs a distinct Cross; tho' sometimes the shortest Cross is made to serve two sides of the Staff; that is, the Breadth is for the Ten-Cross, and the Length for the Thirty Cross: besides this, it hath two Crosses more, the longest is the Ninety-Cross; the other is the Sixty-Cross; these 4 Crosses are thus to be understood. The

10	} Cross, belongs to that	} 3	} and ending at	} 10		
30					} 10	
60						} 20
90						
side beginning at						

The Figure of the Fore-staff.



The Use of the Fore-staff.

It's common and ordinary at Sea, to take the Meridian Altitude of the Sun or Stars with this Instrument, and by it find the Latitude they are in.

To perform which, take notice of these Precepts following :

1. *Note*, The 10, 30, 60 and 90 Cross, is to be used according as the Meridian Altitude is more or less ; that is, if less than 10 deg use the 10 Cross ; if between 10 and 30 deg use the 30 Cross ; if between 30 and 60 deg use the 60 Cross ; if more than 60 deg use the 90 Cross.

2. Having considered which Cross (according to the judged Altitude of the Object intended to be observed) is fuitable, put it on the Staff, so that the flat side of the Cross may be towards the flat end of the Staff: Then,

3. Hold the flat end of the Staff (as A) to the corner of your Eye ; there let it rest upon your Eye-bone, as near the corner of your Eye as you can, so it doth not hinder your Sight.

4. Then look to the upper end of the Cross, (as at C) for the Sun, and at the lower end (at B) for the Horizon.

5. But if, at the lower end of the Cross, you see all Sky, and no Water ; then draw the Cross a little nearer to your Eye.

6. If on the contrary, you see all Water and no Sky ; then slide the Cross a little farther from you

7. Then if you see the Center of the Sun at the upper end of the Cross, and the Horizon at the lower end ; then the Cross stands as it ought.

8. Wait till the Sun be on the Meridian, making Observation often : And as the Sun riseth, draw the Cross a little nearer to your Eye.

9. If the Sun be fallen, you will not see the Horizon, for the Water will hide it from you ; and then observing is over at that time : stir now the Cross out of its place ; only see at what Degree, &c. it resteth, on that side of the

Staff belonging to it; and it's the Meridian Altitude of Complement thereof; according to the word *Alt.* or *Comp.* on the Staff.

How to use the Fore-staff Backward.

THis is only used with the Sun, and for this purpose the Ten-Cross hath another piece of Wood, or Ivory, put cross it; so that the lower edge of this Cross piece lieth even with the middle of the Square Hole in the Ten-Cross, which also answers to the middle of the thickness of the Staff.

There is also a Plate of Brass with a Hole in it, and so fitted, that it will slide off and fit the ends of the 90, 60, or 30 Cross: these two things added to a Fore-staff, make it fit for a Backward Observation of the Sun, which is thus:

1. According as the Meridian Altitude of the Sun is more or less, so use the 90, 60, or 30 Cross; putting it on the Staff, the flat side of it even with the flat end of the Staff, there screw it fast; and at one end of the Cross, slip on the foresaid Brass Plate, so as to leave a slit sight through it, near the lower end of the Cross.

2. Put the Ten-Cross (having a cross piece on it) on the Staff, the flat side of it towards the other Cross, at the Staff's end.

3. Turn your back to the Sun, look thro' the slit in the Brass, at the lower end of the Cross, for the shadow of the upper end of it, lying on the Ten-Cross, in the Line answering the middle of the Staff, and on each side of the Staff.

4. At the same time, the Horizon should be seen, (thro' the foresaid slit) to lie even with the shadow on the middle Line, in the Ten-Cross, and at each end of it, on both sides the Cross.

5. In looking thro' the slit in the Brass, you see the shadow on the middle Line; but instead of the Horizon you see only Water there; then draw the Ten-Cross nearer,

nearer, till the Shadow and Horizon agree or meet in the said middle Line.

6. On the contrary, looking as before, instead of the Horizon, you see Sky meet the Shadow, on the middle Line; then put the Ten-Cross from you, till you see the Horizon and the Shadow together meet at the middle Line.

7. Continue observing till the Sun be at the highest, and as the Sun Riseth, you must draw the Ten-Cross nearer, in order to keep the Horizon and Shadow together on the middle Line of it.

8. If the Sun be fallen (after you have continued observing as before directed) the Horizon will lie below the Shadow on the middle Line, then is the observing finished at that time: stir not the Ten-Cross out of its place; for where it now stands, (on that side of the staff belonging to the Cross, at the end of it) is the Sun's Meridional Altitude, or Complement thereof, as before in observing forward.

Thus I have shewed how to take an Observation by the *Cross-staff*, and that both Forward and Backward. The next thing in course will be to shew how to Work it; and for that, take notice of these following Rules.

To Work an Observation.

1. IF the Sun or Star hath North Declination, and be on the Meridian to the Southwards of you, Subtract the Declination from the Meridian Altitude, the Remainder is the height of the Equinoctial, or Complement of the Latitude North.

2. But if the Object observed hath South Declination, Add the Sum (if it exceed not 90 deg.) is the height of the Equator, or Complement of the Latitude North: If the Sum exceed 90 deg subtract 90 from it, the Remainder is the Latitude South.

3. If the Object hath North Declination, and be on the Meridian to the Northwards, Add the Declination to the Meridian

Meridian Altitude; the Sum (if it exceed not 90 deg.) is the height of the Equator, or Complement of the Latitude South: But if it doth exceed 90 deg. subtract 90 deg. from the said Sum, the Remainder is the Latitude North.

4. If the Sun hath South Declination, and be to the Northwards at Noon, Subtract the Declination from his Meridian Altitude, the Remainder is the Complement of the Latitude South.

5. When the Sun hath no Declination, the Meridian Altitude is the Complement of the Latitude North; if he be South, at Noon, and the contrary.

6. If the Sun be in the Zenith, and at the same time he hath no Declination, you are then under the Equinoctial.

7. But if the Sun hath North, or South Declination, and in the Zenith; the Declination is the Latitude you are in, North or South.

8. If you observe Sun or Star upon the Meridian, beneath the Pole, Add the Meridian Altitude to the Complement of the Sun, or Star's Declination, the Sum is the height of the Pole, or Latitude of the Place.

These Eight Rules are explained by the Examples following.

Examples for Working an Observation in North Latitude.

Example 1. Admit at Sea, I observe the Sun's Meridian Altitude to be 42 d. 20 m. South; and at the same time the Sun's Declination is 10 d. 10 m. North. I demand the Latitude I am in?

	D.	M.
The Meridian Altitude — — — — —	42	20 South
The Sun's Declination — — — subtract	10	10 North
The Complement of the Latitude — — — — —	32	10
Subtract it from — — — — —	90	00
The Latitude I am in, is — — — — —	57	50 North.

Example

Example 2. Being at Sea the 22 Day of May, Anno 1720. I find the Sun's Meridian Altitude to be 65d. 10m. South, I demand the Latitude?

	D.	M.	
The Meridian Altitude	65	10	South.
The Sun's Declination	subtract	22	15 North.
The Complement of the Latitude	42	55	
Subtract it from	90	00	
The Latitude I am in, is	47	05	North.

Example 3. At Sea the 27th day of November, Anno 1723. I find the Sun's Meridian Altitude to be 26 deg. 30 min. South, I demand the Latitude I am in?

	D.	M.	
The Meridian Altitude	26	30	South.
The Sun's Declination	add	22	44
The Complement of the Latitude	49	14	
Subtract it from	90	00	
The Latitude I am in, is	40	46	North.

Example 4. At Sea the 25th of April, Anno 1721. I find the Sun's Meridian Altitude by Observation, to be 58d. 45 m. South, I demand the Latitude I am in?

	D.	M.	
The Meridian Altitude	58	45	South.
The Declination	subtract	16	33 North.
The Complement of the Latitude	42	12	
Subtr. it from	90	00	
The Latitude I am in, is	47	48	North.

Example 5. Admit, the 12th Day of June, 1721. I find the Sun's Meridian Altitude, by Observation, to be 80d. 35m. North; I demand the Latitude I am in?

The

	D.	M.
The Meridian Altitude	80	35 North.
The Sun's Declination	add 23	29 North.
The Sum (exceeds 90 degrees)	104	64
From it subtract	90	00
The Latitude I am in, is	14	04 North.

Example 6. Admit, *August 22d, 1723.* The Sun's Meridian Altitude was observed to be 85d. 15m. North; I demand the Latitude of that Place?

	D.	M.
The Meridian Altitude	85	15 North.
The Sun's Declination	add 08	08 North.
The Sum (exceeds 90 degrees)	93	23
Therefore from it subtract	90	00
The Latitude of that Place is	03	23 North.

Example 7. Admit, in a Ship at Sea, *June 19th 1723.* The Sun's Meridian Altitude was 66d. 45m. North; I demand the Latitude the Ship is in?

	D.	M.
The Meridian Altitude	66	45 North.
The Sun's Declination	add 23	15 South.
Complement of the Latitude	90	00
Subtract it from	90	00
The Ship is under the Equinoctial	00	00

Examples to find the Latitude, by observing the Stars.

Exam. 8. Admit, I observe the Bull's Eye upon the Meridian, and find his Meridian Altitude to be 50d. 30m South; I demand the Latitude I am in?

The

D. M.

The Declination of this Star the }
Bull's Eye, is ————— } 15 . 50 North.

The Meridian Altitude of the Star — 59 . 30 South.

The Star's Declination ————— subtract 15 . 50 North

Complement of Latitude, is ————— 34 . 40

Subtract it from ————— 90 . 00

The Latitude I am in, is ————— 55 . 20 North.

Exa. 9. Admit, I observe the bright Star in the *Great Dog's Mouth*, and I find his Meridian Altitude to be 35d. 45m. South; I demand the Latitude I am in.

D. M.

The Declination of the *Great Dog's* }
Mouth, is ————— } 16 . 15 South.

The Meridian Altitude of the Star — 35 . 45 South.

The Star's Declination ————— add 16 . 15 South.

The height of the Equator, is ————— 52 . 00

Subtract it from ————— 90 . 00

The Latitude I am in, is ————— 38 . 00 North.

Examples for working an Observation in South Latitude.

Exam. 10. Admit the 10th Day of May, Anno 1722. I find the Sun's Meridian Altitude, by Observation, to be 62d. 00m. North; I demand the Latitude the Ship is in?

D. M.

The Meridian Altitude ————— 62 . 00 North

The Sun's Declination ————— add 20 . 10 North

The Complement of the Latitude is — 82 . 10

Subtract it from ————— 90 . 00

The Latitude the Ship is in, is ————— 7 . 50 South

Exa. 11. Admit the 15th day of January, Anno 1720. in Longitude 150d. East, I find the Meridian Altitude, by Observation, to be 58d. 45m. North; I demand the Latitude the Ship is in?

The

The Sun's Declination in the Merid. of London, for the 15th of January is 18d. 52m. the daily difference at this time is 15 m. decreasing; therefore (in the Table of Proportion) in Page 20 you will find the proportional Minutes to be 6m. which add to the Declination in the Meridian of London, the Sum is 18d. 58m. South; the Sun's true Declination for the Longitude of 150d deg. East.

D. M.

The Meridian Altitude ————— 58 . 45 North.

The Sun's Declination ————— subtract 18 . 58 South.

Complement of the Latitude, is ——— 39 . 47

Subtract it from ————— 90 . 00

Latitude the Ship is in, is ————— 50 . 13 South.

Example 12. Admit, the 12th Day of July, Anno 1723. I find the Sun's Meridian Altitude to be 66d. 52m. North; I demand the Latitude?

D. M.

The Meridian Altitude ————— 66 . 52 North.

The Sun's Declination ————— add 20 . 14 North.

Complement of the Latitude, is, ——— 87 . 06

Subtract it from ————— 90 . 00

The Latitude required is ————— 02 . 54 South.

Example 13. A Ship at Sea, the Sun's Declination being 15d. 30m. South, and the Sun's Meridian Altitude 80d. 45m. South; I demand the Latitude the Ship is in?

Answer. The Latitude is 0 d. 15 m. South.

Example 14. The Sun's Declination being 11d. 14m. South, and his Meridian Altitude 79d. 38m. South; I demand the Latitude?

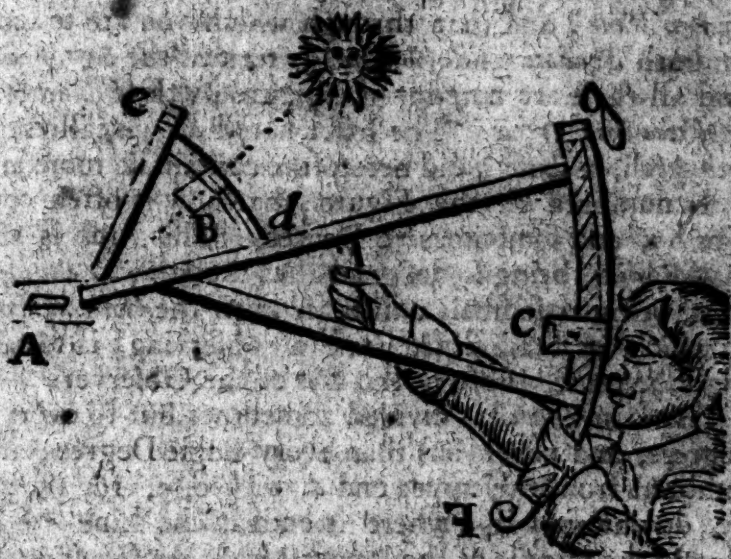
Answer. The Latitude is 0 d. 52 m. South.

Note 1. If you observe by the lower part of the Sun, you must Add 16m. for the Sun's Semidiameter, and the Sum will be the true Altitude of the Sun's Center.

Note 2. If you observe by the upper Limb of the Sun, subtract 16m. the Remainder is the Altitude of the Sun's Center.

The

The Figure of the QUADRANT.



The Description and Use of the QUADRANT.

THIS Instrument, (called a *Quadrant*, first invented by our Country-man Capt. *Davis*, and thence called *Davis's Quadrant*,) is of a very commodious Form; at present, the most general approved Instrument at Sea, for observing the Sun's Meridian Altitude.

The form of it (as in the Figure prefixed) may be of any Radius, or Length, between 18 Inches and 3 Feet; but the most general now made, are *QUADRANTS* of 24 Inches Radius, with one Arch 65 Degrees, the other 25 Degrees, and a Glass in the Shadow Vane.

The Principal Parts are 3 Vanes, and 2 Arches; on which Arches the Degrees, both together make 90 deg. from whence it hath the Denomination of a *Quadrant*.

The

The *Horizon Vane* (marked in the foregoing Figure AB, and with its Name) respects the *Horizon* in time of observing; that which gives the Shadow, is named the *Shadow Vane*; and that through which you are to look for both *Shadow* and *Horizon*, is termed the *Sight Vane*: And all these are noted in the Figure by their Names.

Of the two Arches. The lesser noted *d e*, is called the 60th Arch, because it did heretofore contain no more, and is so numbred in the Figure; but now it often contains 65, and sometimes 70 Degrees: This Arch is of a small Radius, being so designed that the *Shadow Vane* used on it, being at so small a distance from the *Horizon Vane*, on which its shadow (in time of observing) is to fall, might be more visible to the Eye of the Observer.

This *Little Arch* is divided sometimes but to every 5 Degrees, and never less than every single Degree; it's numbred from the upper end *d*, with 0, 5, 10, 15, 20, &c. downwards to *e*, where it ends in the Line *AeF* (a Line in the middle of the longer *Leg* of the *Quadrant*) at 60, 65, or 70 Degrees, according as the other Arch is divided, so that the Numbers at *e* and *F* together, ever must make 90 Degrees.

The greater Arch *CF*, is called the 30th Arch; it's of a large Radius, that it might contain the lesser Divisions of a Degree: and being of a competent Breadth, thereon are usually described 10 *Concentrick Circles*, intersected with three Diagonal Lines in each Degree, making each Intersection 2 Minutes of a Degree.

This *Great Arch* is divided on the Limb, into Degrees by long Stroaks, each again subdivided into 6 equal parts by shorter Stroaks; each small division being 10 Minutes, and are numbered from the lower end *C*, with 5, 10, 15, &c. upward to *F*, where it ends in the Line *AeF*, either at 20, 25, or 30 Degrees, the Figures always at *F* and *e*, together, makes 90; as in this Figure are 30 and 60.

The Use of the Quadrant.

THIS Instrument is rarely used otherwise than to observe the Sun's Meridian Altitude; which to perform, I thus describe.

1. Put the *Horizon Vane* AB, on the end A, and home to the Center A; the *Sight Vane* put on the Arch CF, close to the back of it; and the *Shadow Vane* put on the little Arch DE, home to the back of it, and the upper edge of the Vane set to a number of Degrees less than the Complement of the Altitude by 15, or 20 Degrees.

2. The Vanes being thus Fixed upon the *Quadrant*, turning your Back towards the Sun, the end C in your Hand, and F uppermost, look thro' the *Sight Vane*, causing the upper edge of the Shade of the *Shadow Vane*, to lie upon the upper edge of the Slit in the *Horizon Vane*, where is drawn a black Line; at the same time, if the *Horizon* appear thro' the said Slit in the *Horizon Vane*, the Vanes on the *Quadrant* stand at the Sun's present Altitude.

3. But if the Sky appear instead of the *Horizon*, slide the *Sight Vane* a little higher towards F: on the contrary, if the Sea appear instead of the *Horizon*, then slide the *Sight Vane* lower towards C; continue so to do, till the *Horizon* appear thro' the *Horizon Vane*.

4. In order to obtain the Meridian Altitude, (which is the greatest the Sun will have that Day, and the thing used to find the Latitude) continue observing; and as the Sun rises, the Sea will appear thro' the *Horizon Vane*; and the *Sight Vane* must be slid lower accordingly: thus do, observing as often as may be convenient, till the Sun is at the highest.

5. When the Sun begins to fall, the Sky will appear thro' the *Horizon Vane* instead of the *Horizon*, then desist observing for that Day.

6. Having thus done, Add the Degrees the upper edge of the *Shade Vane* standeth at, to the Degrees and Minutes cut by the inside of the *Sight Vane*, their Sum is the Com-

L

ple-

plement of the Sun's Meridian Altitude, or the distance of the upper edge of the Sun from the Zenith; to which Sun Add 16 Min. the Sun's Semidiameter; and the last Sum is the distance of the Sun's Center from the Zenith, being the true Complement of the Sun's Meridian Altitude.

Note; The upper edge of the shade of the Shadow Vane respects the upper Limb of the Sun; and the lower edge of the said shade, answers to the lower Limb of the Sun; so that observing by the first, you are to Add 16 Minutes. On the contrary, observing by the latter, Subtract 16 Minutes to, or from what's on the Quadrant; the Sum or Difference, is the distance of the Sun's Center from the Zenith; called his Zenith Distance, or Complement of his Meridian Altitude.

Thus I have shewed how to take an Observation with the Quadrant; I come now to shew how to work it. The Difference in working an Observation taken by the Forestaff and the Quadrant, is only this: By the Forestaff you take the Altitude, by the Quadrant the Complement of the Altitude, or the Distance of the Sun from the Zenith. *Altitude* is the Distance of the Sun from the Horizon; therefore if you Subtract the Complement of the Altitude from 90 Degrees, the Remainder is the Altitude, which you may use as in the Use of the Forestaff, in Page 151.

But it's usual to work Observations (made by the Quadrant) by the Complement of the Sun's Meridian Altitude; I will therefore give some general Rules, and some particular Examples for their Explanation.

The General Rules are,

1. If the Sun hath North Declination, and upon the Meridian to the Southwards of the Observer; Add the Sun's Declination to the Zenith Distance (or Complement of the Sun's Meridian Altitude) the Sum is the Altitude you are in, North.

2. If the Sun be to the Southward of you, and hath South Declination, Subtract the Sun's Declination from

the Zenith's Distance, the Remainder will be the Latitude you are in, North: But if the Declination exceed the Zenith Distance, Subtract the lesser from the greater, and the Remainder is the Latitude South.

3. If the Sun be to the Northward of you, and hath South Declination; Add the Sun's Declination to his Zenith Distance, the Sun will be the Latitude South.

4. If the Sun be to the Northward of you, and hath North Declination; Subtract the Sun's Declination from his Zenith Distance, the Remainder will be the Latitude South: But if the Declination exceed the Zenith Distance, Subtract the lesser from the greater, and it gives the Latitude North.

I might have given more general Rules; but if you understand those 8 Rules for the Use of the Forestaff, you can't err in these, using the Quadrant: And for their Explanation, see the Examples following.

Working an Observation in North Latitude.

Example 1.

ON the 10th of April, 1721, the Sun came to the Meridian in the South; and by Observation, found his Zenith Distance, or Complement of his Meridian Altitude, to be 34d. 47m. that is, his upper Limb was so much from the Zenith: I demand the Latitude of the Place of Observation?

D. M.

Complement of the Sun's Meridian Altit. 34 . 47 South
The Sun's Semidiameter ———— Add 00 . 16

Distance of the Sun's Center from Zenith 35 . 03 South
Declination North ———— Add 11 . 53 North
Latitude of the Place required is ——— 46 . 56 North

Example 2. The 14th day of August, Anno 1720. I found the Complement of the Sun's Meridian Altitude, by Observation, to be 28d. 48m. South; I demand the Latitude the Ship is in?

L. 2

Compl.

	D.	M.
Compl. of the Sun's Meridian Altitude	28	48 South
Sun's Semidiameter	—	Add 00 . 16
Distance of the Sun's Center from Zenith	29	04 South
The Sun's Declination	—	Add 10 . 48 North
The Latitude the Ship is in	—	39 . 52 North

Example 3. September 13th 1722, I find the Complement of the Sun's Meridian Altitude, by Observation, to be 47d. 35m. South ; I demand the Latitude I am in

	D.	M.
Complement of the Sun's Meridian Alt.	47	35 South
Sun's Semidiameter	—	Add 00 . 16
Distance of Sun's Center from Zenith	47	51 South
The Sun's Declination	—	Subtract 00 . 22 South
Latitude the Ship is in	—	47 . 29 North

Example 4. The 5th Day of November, Anno 1721, find the Complement of the Sun's Meridian Altitude, by Observation, to be 52d. 00m. South ; I demand the Latitude the Ship is in ?

	D.	M.
Complement of Sun's Meridian Altitude	52	00 South
Sun's Semidiameter	—	Add 00 . 16
Distance of Sun's Center from the Zenith	52	16 South
The Declination of the Sun	—	Subt. 18 . 48 South
Latitude the Ship is in	—	33 . 28 North

Example 5. The 27th of May, 1724, The Sun to the Northward of me ; and the Complement of his Meridian Altitude by Observation, to be 10 d. 15m I demand the Latitude the Ship is in ?

	D.	M.
Sun's Declination	—	22 . 49 North
Complement of Sun's Meridian Altitude	10	15 North
The Sun's Semidiameter	—	Add 00 . 16
The Sun's true Zenith Distance	Subt.	10 . 31 North
Latitude the Ship is in	—	12 . 18 North

Example

Example 6. Admit the 29 Day of June, Anno 1723. The Sun upon the Meridian, I find, by Observation, the upper Limb of the Sun is 6 d. 42 m. to the Northward of my Zenith; I demand the Latitude I am in?

D. M.

Sun's Declination	_____	22 . 21	North
Sun's supreme Marg. distance from Zen.	_____	06 . 42	North
Sun's Semidiameter	_____	add 00 . 16	
Dist. of Sun's Center from Zenith subt.	_____	06 . 58	North
Latitude the Ship is in	_____	15 . 23	North

Example 7. The 21st of July, Anno 1722. in Longitude 165 deg. West, and the Sun being upon the Meridian, I find, by Observation, the supreme Margin of the Sun is 16d. 43m. to the Northward of my Zenith; I demand the Latitude the Ship is in?

D. M.

The Sun's Declination at London	_____	18 . 08	North
Proportional Minutes for Long. — subt.	_____	00 . 06	
Sun's Declination in the Meridian given	_____	18 . 02	North
Sun's supreme Margin. Dist. from Zenith	_____	16 . 43	North
Sun's Semidiameter	_____	add 00 . 16	
Sun's Center dist. from the Zenith subt.	_____	15 . 57	North
Latitude the Ship is in	_____	01 . 01	North

Working an Observation in South Latitude.

Example 8. **T**HE 14 Day of July Anno 1723. in Longitude 150 deg. East, and the Sun being upon the Meridian, I find the Complement of his Meridian Altitude, by Observation, to be 48d. 28m. North; I demand the Latitude the Ship is in?

	D.	M.
Complement of Sun's Meridian Altitude	48	28 North
Sun's Semidiameter	add 00	16
Sun's Center distant from the Zenith	48	44 North
Sun's Declination for the Longit. sub	19	54 North
Latitude the Ship is in	28	55 South

Example 9. The 25th of October, Anno 1723. in Longitude 120 deg. West, and the Complement of the Sun's Meridian Altitude, by Observation, is 27 d. 29m. North. I demand the Latitude the Ship is in?

	D.	M.
Compl. of the Sun's Meridian Altitude	27	29 North
Sun's Semidiameter	add 00	16
Sun's Center distant from the Zenith	27	45 North
The Declination of the Sun Prop. add	15	41 South
Latitude the Ship is in	43	26 South

Example 10. Admit, The 24th of December, Anno 1723. I find the Sun upon the South part of the Meridian, and by Observation, the Complement of the Sun's Meridian Altitude 15d. 10 min. I demand the Latitude the Ship is in?

	D.	M.
Compl. of the Sun's Meridian Altitude	15	10 South
Sun's Semidiameter	add 00	16
Sun's Center distant from the Zenith subt.	15	26 South
The Declination of the Sun	22	47 South
Latitude the Ship is in	07	21 South

Thus much I thought necessary to add by way of explanation of the foregoing Rules in Page 161; which shew a perfect way by off observing; that is, how to take and work an Observation with more exactness than hath been formerly used.

Note 1. The Sun's Semidiameter, here added to the Complement of its Meridian Altitude, may be contrived to be on the Quadrant, that it's Addition by the Pen may be omitted; for this purpose the Quadrants Sold by *James Atkinson* at *Cherry-Garden Stairs* on *Rotherhithe Wall*, have on the back edge of the Little Arch, (every 5 deg. numbered, differing from those on it's flat side) the Semidiameter of the Sun: So that placing the upper edge of the Shadow Vane to the Degree on the foresaid back edge of the Arch, the Quadrant then sheweth the true Complement of the Altitude, or the distance of the Sun's Center from the Zenith; which prevents adding 16 min. after observing.

Note 2. There is another Contrivance of late, which is putting a Convex-glass in the middle of the edge of the Shadow Vane; which Glass, in time of observing, is to cast an illuminated Spot on a round black Spot made in the Horizon Vane: This is useful when the edge of the Shade of the Shadow Vane is not very conspicuous; that being discernable when the latter is not. The manner is thus:

Set that part of the *Shadow Vane* which is right against the middle, or Center of the Glass, to the Degrees on the Little Arch, and then cause the inlightned Spot of the Glass to lie on a black Spot or Circle on the *Horizon Vane*; at the same time look for the *Horizon* thro' it, as before directed in Page 160; so you will have (observing by this Glass in the Vane) the true Complement of the Sun's Altitude, or the Distance of his Center from the Zenith.

The Description and Use of the NOCTURNAL.

1. **THE** *Nocturnal* consists of 3 Parts; the first, termed the Unmoveable Part, is the broadest and greatest, on which is a Handle to hold it by in time of Observation or using it.

On the foreſide of which, in the outermoſt Circle, are the 12 Months, and each Month ſubdivided into its reſpective Days, or at leaſt every two Days: They are counted towards the right hand; marked with their Names, or the firſt 3 Letters thereof; as *Jan.* for *January*, *Feb.* for *February*, *Mar.* for *March*, &c. Within the Circle of Months, is a Circle divided into 24 Equal Parts or Hours, each Hour divided into Halfs, and Quarters; uſed to find the Time of *Full-Sea*, or *Higb-Water*.

On the back ſide of this Part, are the 32 Points of the *Mariners Compass*, *South* uppermoſt, and *East* on the left hand; to each Point is ſet the Declination of the *Norith Star*, above or under the Pole; which is known by *Und.* for *Under*, and *Abo.* for *Above*.

There have formerly been made two ſorts of *Noſturnals*, one for the *Great Bear*, the other for the *Little Bear*: Thoſe made for the Guards of the *Great Bear*, or *Charles's Wain*, commonly called the 2 *Pointers*, have *February* at the top: But thoſe made for the Guards of the *Little Bear*, have *April* at the top: But they are now made for both *Bears* in one *Noſturnal*; and are known by having either 2 Circles of Months, marked *GB*, and *LB*; or 2 ſhort Teeth, or Indexes, proceeding from the Second or Middle Part of it; and marked *GB*, and *LB*; ſignifying *Great Bear*, or *Little Bear*.

2. The ſecond moveable middle Part, hath 2 Circles on it; the outermoſt is divided into the 29 Days and $\frac{1}{2}$ of the *Moon's Age*; the innermoſt is divided into 24 equal Parts or Hours, each Hour ſubdivided in Halfs and Quarters; this Part hath a Tooth, or ſhort Index, proceeding from it, with the edge continued in a right line from the Center; which is to be ſet to the Day of the Month when uſed: Some have 2 Indexes marked *G* on one, and *L* on t'other; *G* ſtanding for *Great Bear*, and *L* for *Little Bear*; ſignifying the *Noſturnal* is made for both *Bears*, and may be uſed for either.

3. The

3. The third and moveable Part, is called the *Index*, its uppermost, on the fore-side of the Instrument, having one edge proceeding in a right line from the Center, which (in time of Observation) must be turned to the Guards: Thro' all 3 pieces, in the Center of the Instrument, is a Hole, thro' which you are to see the North-Star, when the Index is turned to the Guards.

The Use of the Nocturnal.

BY it may be found the Hour of the Night, the Bearing of the Guards and the Declination of the North-Star from the Pole; by which may be found the Latitude; as shall be shewed in order.

I. To find the Hour of the Night.

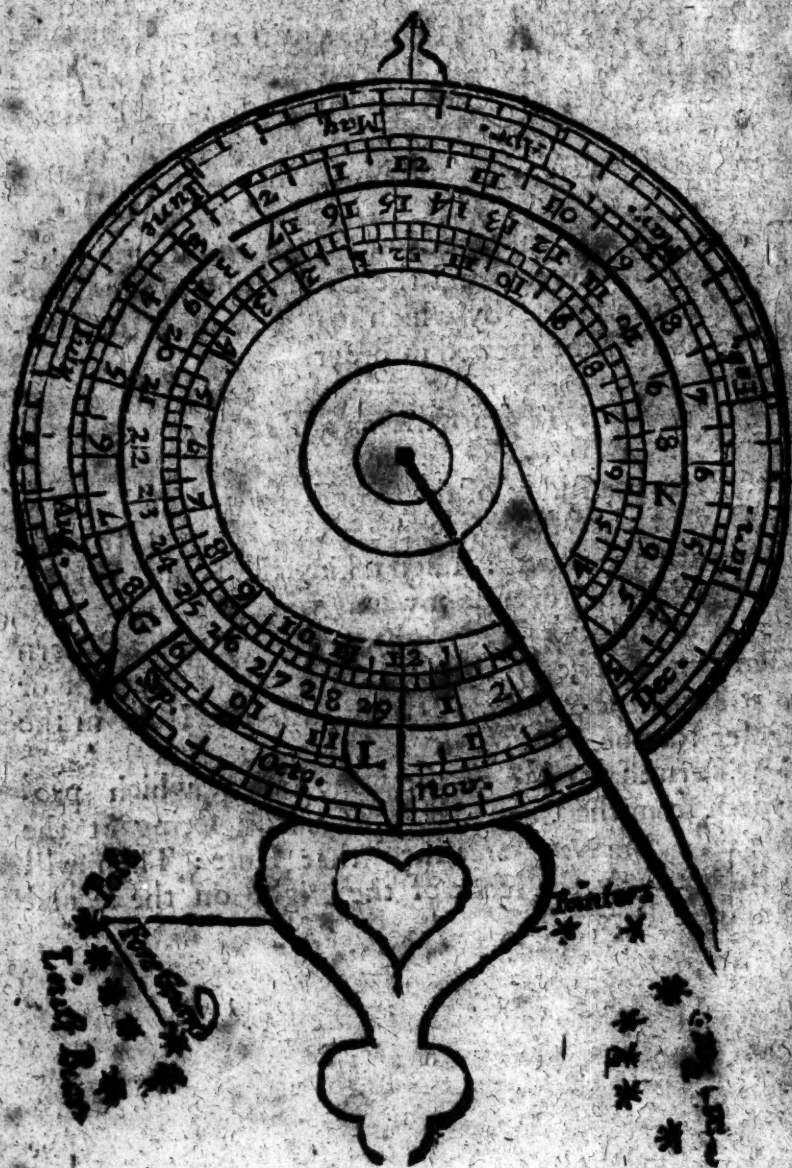
1. Place the Index of the second, or middle Piece, to the Day of the Month, where it's to be kept till the Observation is ended: Then taking the Handle in your Hand, with the fore-side towards you.

2. And holding it upright (which you may discern when you do so, by the tip on the top of the first or great Part of the Nocturnal) look thro' the Hole in the Center for the North Star.

3. Turn that edge of the Long Index, which proceedeth from the Center, to the Guards, seeing at the same time the North Star thro' that Hole: Then will the Index shew the Hour of the Night on the second or middle Part.

The

The Figure of the Nocturnal.



2. To find the Bearing of the Guards either of the Little or Great Bear; that is, upon what Point of the Compass they are, and thereby the North-Star's Declination from the Pole.

1. Having observed all the particular Directions as before, in finding the Hour of the Night, you see the North Star thro' the Hole, and the Guards by the edge of the Long Index.

2. Then look on the backside of the Nocturnal, what Point of the Compass standeth against the foresaid edge of the Index; which is the Bearing of the Guards; and at the said Point of the Compass is figured the North Star's Declination from the Pole, at that time, either above, or under.

Example 1: The 20th of December, at 6 of the Clock in the Morning, observing the Pointers or Guards of the Great Bear by the edge, of the Index; I demand their Bearing, and Declination of the North Star.

Right against that edge of the Index (you observe with) and on the backside of the Nocturnal, is S W. by S. the Point of the Compass required: And on the said Point of the Compass is 2 d. 33 m. and signifying the North Star is then 2 d. 33 m. under the Pole.

Example 2. The 14th of February, (I observe according to the Directions before given) at 7 o' Clock in the Evening, the Guards of the Little Bear by the edge of the Long Index; I demand their Bearing, and Declination of the North Star?

Seeing the North Star thro' the Hole in the middle, and the Guards of the Little Bear, by the edge of the Long Index (note always that edge respecting the Center of the Instrument and the Index cutting 7 of the Clock; then on the backside of the Nocturnal, and against the said edge of the Index, is N. E. the Point of their Bearing; and on the said Point is figured ed. 55 m. Abo. which signifieth the North Star is then 55 Minutes above the Pole.

3. *To find the Moon's Southing by the Nocturnal.*

To do this look the Moon's Age in the outermost Circle, on the middle or second Piece of the Nocturnal; and right against it, in the innermost Circle of the same Piece, is the Southing.

Example. If the Moon be 19 Days old; I demand her Southing?

Right against 19, in the outermost Circle, is almost $3\frac{1}{2}$ in the innermost Circle; which is half an hour past 3 of the Clock in the Morning; the time of the Moon's coming to the South.

4. *To find the time of full Sea by the Nocturnal.*

1. Set the Short Index of the middle Part (if it have 2 Indexes, that) which stands at 12, to the time of Full-Sea, on the New, or Full-Moon (for the place proposed) in the innermost Circle of the great Piece.

2. Keeping that there, bring the Long Index to the (Southing, or) Moon's Age on the middle Piece.

3. Then right against the Long Index, and in the innermost Circle on the great Piece, is the time of Full Sea required.

Example. The Moon being 19 Days old; I demand the time of Full-Sea at Gravesend?

1. Bring the Index of the middle Part (which stands at 12) to $1\frac{1}{2}$ Hour, (which is N. N. E. and S. S. W. the Point of the Compass making Full-sea at *Gravesend* on the New, and Full-Moon) in the innermost Circle of 24 Hours on the great Piece; Keeping that fast there.

2. Turn the Long Index to 19 Days, (the Moon's Age, or to $3\frac{1}{2}$ Hours, the Moon's Southing) on the middle Piece.

3. Then right against the Long Index; and in the innermost Circle (on the great Piece) is 5 Hours; the time of Full-Sea, or High-water, in the Morning at *Gravesend*.

5. *To find the Latitude by the Nocturnal, and Forestaff.*

1. Find

1. Find the North Star's Declination from the Pole by observing with the Nocturnal, as directed in *Example 1*, and 2, of the Second Use in Page 168, and 169.

2. Then (at the same time) with a Forestaff, take the Altitude of the North Star.

3. If the North Star be above the Pole, subtract its Declination from ; if under, add it to its Altitude; the Sum or Difference, is the Latitude required.

Example 1. Suppose the 14th of February, at 7 of the Clock in the Evening, observing with the Nocturnal, you find the Guards of the Little Bear, to bear N. E. which is, *od.* 35m. above the Pole ; and at the same time, by the Forestaff, find the Altitude of the North Star *42d.* 10m. I demand the Latitude of the Place ?

D. M.

From the Altitude of the North Star — *42 . 10*

Subtract its Declination above the Pole *00 . 35*

Remainder is the Latitude Required — *41 . 35 North*

Example 2. The 20th of December, at 6 of the Clock in the Morning, observing with the Nocturnal, I find the Guards or Pointers of the Great Bear S. W. by S. which is *2d.* 33m. under the Pole ; and at the same time, by the Forestaff, find the Altitude of the North Star *45d.* 22m. I demand the Latitude of the Place of Observation?

D. M.

To the Altitude of the North Star — *45 . 22*

Add its Declin. from the Pole under *2 . 33*

Sum is the Latitude required — *47 . 55 North.*

The Description and Use of Gunter's Scale.

THIS Instrument, for its quick and easie dispatch of the most common and useful Proportions; deserves

as generally to be known in its Uses, as by its Name: On that account, I'll touch on its Description, before its manifold Uses; as brief and as plain as I can.

1. *Gunter's Scale* (so called from Mr *Gunter* its first Contriver) is usually made of Box-Wood, commonly 2 feet long, and $1\frac{1}{2}$ Inch broad, on which are the Lines or Scales of Numbers, Sines, Tangents, &c. Of which are two sorts, the *Long* or *Single Gunter*, and the *Sliding Gunter*: on both sorts are the same Lines, tho' differently used; the first sort with Compasses, the latter by Sliding.

2. The (Lines most usual now) set on *Gunter's*, are 8, and have their Names at the right hand end thereof, under one another thus; *Sine-Rhumb*, *Tang-Rhumb*, *Numbers*, *Sines*, *Verse-Sines*, *Tangents*, *Meridian* (for *Meridional Parts*) and *Equal Parts*.

3. The *Sine-Rhumb* and *Tang-Rhumb*, are both Points of the *Mariners Compass*; the first is figured from the left hand towards the right, with 1, 2, 3, 4, 5, 6, 7, and 8, at which is a Brass Center-pin; the latter is figured thus, 1, 2, 3, and 4, at the said Center-pin, and thence back again towards the left-hand with 5, 6, and 7; each Point in both Lines, (where it can) is subdivided into Halfs, and Quarters, these two Lines are only useful in Navigation.

4. The next under *Tang. Rhumb.* is the *Line of Numbers* figured thus; near the left hand end, it begins at 1, and towards the right-hand is 2, 3, 4, 5, 6, 7, 8, 9; then in the middle, at which is a Brass Center-pin; going still on 2, 3, 4, 5, 6, 7, 8, 9, and 10, at the end, where is another Center-pin: This Line is of General Use, and requires the larger Account of it: Wherefore take these three following Notes for the *Line of Numbers*.

Note 1 *All the Figures on this Line may be taken single as they stand; or be increased, or diminished at pleasure, so it be in double or Ten-fold Proportion.* That is, the first 1 may

may be counted for 1 or 10, or 100, or 1000, &c. then the next 2 is accordingly 2, or 20, 200, or 2000, &c. Again, the first 1 may be reckoned for 1 Tenth, or 1 hundredth, or for 1 Thousandth Part, &c. then the next 2 is 2 Tenths, or for 2 Hundredths, or 2 Thousand Parts, &c. So that,

If the first 1 be taken for 1, the middle 1 is then 10 and 2 to its right hand is then 20. 3 is then 30, 4 is 40, and 10 at the end is 100: Again; If the first 1 be counted 10, the next 2 is 20; 3 is 30, and so on making the middle 1 now 100, the next 2 is 200, 3 is 300, 4 is 400, and 10 at the end is now 1000.

In like manner, if the first 1 be esteemed for 1 tenth Part, the next 2 is 2 tenth, and the middle 1 is now 1; and next 2 is 2; and ten at the end is now 10: Again; if the first 1 be counted for 1 hundred Part; the next 2, is 2 hundredth Parts; the middle 1, is now 10 hundredth Parts or 1 tenth Part; and next 2 is 2 tenth Parts; and 10 at the end, is now but 1 whole Number or Integer.

Note 2. *As the Figures are increased, or diminished in their Value; so in like manner must all the intermediate Stroaks or Subdivisions, be increased, or decreased: That is,* if the first 1 (at the left hand) be counted 1, then 2 (on the right hand of it) is 2; and each Subdivision between them is now 1 tenth Part; and so all the way to the middle 1, which now is 10; the 2 next it is 20; now the longer Stroaks between 1 and 2, are to be counted from 1 thus, 11, 12, (where is a Brass-pin) then 13, 14, 15, (something a longer Stroak than the rest) then 16, 17, 18, 19, and 20, at the Figure 2: And all the shorter Stroaks between these longer, are now, each to be counted for a tenth Part; from the middle 1 to the next 2, now 20; from whence the longer Stroaks between the Figures, are Units; thus, 21, 22, 23, &c. to 3 which now is 30; and the shorter Stroaks between them, each now is $\frac{1}{2}$ or 2 tenth Parts of an Integer; from 3, each short

short Stroak (or little Division) is $\frac{1}{5}$ or tenth Parts of a Unit.

Again, if 1 at the left hand be 10, the Figures between it and the middle 1, are common Tens, and the Subdivisions (between each Figure) are Units; and from the middle 1 to 10 at the end, each Figure is so many Hundreds; and between these Figures, each Longer Division, are Tens; and from the middle 1 to 2, each lesser Division, is 1 Unit; from 2 to 3, each lesser Stroak, is 2 Units; from the Figure 3 to the end, each shorter Stroak, is 5 Units.

Note 3. On the Line of Numbers, may be counted a Number of any Denomination: whether Measure; as Inches, Feet, Yards, Miles, Leagues, &c. Or Weight; as Hundreds, Pounds, Ounces, &c. or Money; as Pounds, Shillings, Pence, &c. Or Time, as Years, Months, Days, Hours, &c. provided always the Integer be divided, or supposed to be divided Decimally, or into Tens.

5. Next under Numbers is the Line of Sines, beginning at the left hand, and figured thus; 1, 2, 3, &c. to 10; then 20, 30, 40, &c. to 90, ending at the right hand, where is a Brass Center-pin: These Figures never change their Value, nor Denomination, being here (and in all other Lines under it) called Degrees.

From the beginning of this Line to 10 Degrees, each Degree is divided into 12 Parts, by greater and lesser Stroaks, making each 5 Minutes; from 10 Degrees to 20, each smaller Stroak is 10 Minutes; from 20 to 30 Degrees, each is 15 Minutes, from thence to 60 Degrees, some are 20, but the most are 30 Minutes; each lesser Subdivision; and from 60 to 80 Degrees, each Division is a Degree; 80 and 90 are so near together, that it admits but one Stroak between, which is for 85 Degrees.

6. Next to, and abutting on the Line of Sines, is the Versed Sines, beginning at the right hand against 90 in the Sines) and from thence figured towards the left hand;

*

thus,

thus, 10, 20, 30, 40, &c. ending at the left end about 169 Degrees; the Subdivisions are thus, from 10 to 30, each is 2 Degrees, from thence to 90, it's single Degrees; from thence to 120, it's $\frac{1}{2}$ Degrees; and from thence to the end its divided into each 15 Minutes.

7. Under *Verse Sine* is the *Line of Tangents*, beginning at the left end, as the *Sines* do; from thence figured to the right hand; thus, 1, 2, 3, &c. to 10; and so on, 20, 30, 40, and 45 at the right hand, where is a little brass Center-pin, just under and even with 90 in the *Sines*; from thence back again, is figured 50, 60, 70, 80, &c. to 89; ending at the left end, where it began at 1 Degree: The Subdivisions of this Line, are (for the most) like those of the *Sines*, in passing that, I proceed.

8. Next to the *Tangents* (and under it) is the *Line of Meridional Parts*, beginning at the right hand, is figured thus, 10, 20, 30, &c. to the left hand, where it ends at 6 Degrees; This Line, with the Line of Equal Parts under it, are used together, and only in that part of Navigation, called *Mercator's Sailing*: The uppermost Line contains the Degrees of the Meridian, or Latitude, in a *Mercator's Chart*, and the lower, as the Equinoctial, contains the Degrees of Longitude.

9. These 8 Lines now described, are set on the *Sliding Gunter*, but not in the same order, being some on one side, and some on t'other; also the Line of Numbers, Sines, and Tangents, are set double, that is, one on each side, as the middle piece slides: Which middle piece is so contrived to slip to and fro easily, to slide out, and to be put in any side uppermost, in order to bring those Lines together (or against one another) most proper for solving the Question wrought by the *Sliding Gunter*: Of which, this short Description may suffice.

The Use of Gunter's Scale, both single and sliding, in Arithmetick.

In order to a right understanding of the Use of this Scale, it's necessary to Number well on it; that is, to

find readily a Place representing any given Number, and that chiefly on the Line of Numbers; which is as follows

Problem I. *To find a whole Number on the Line of Numbers.*

The Rule 1. **L**OOK the first Figure of the given Number among the figured Divisions.

2. For the second Figure, count so many Tenths, (or of the longer Stroaks) from the figured Division, towards the right-hand, as are Units in the said second Figure.

3. Then for the third Figure, count from the last Tenth (representing the second Figure) so many lesser Stroaks (or Centesms) as that Figure hath Units.

4. In like manner, for the fourth Figure, count from the last Centesm, so many Thousands (or lesser Stroaks) as are Units in it; and so on for more Figures, tho' four Figures or Thousands, are as many as well can be discerned on a two Foot Gunter.

5. This done, the last place is the Point where the propounded Number is represented.

Example 1. *To find the Point in the Line of Numbers that doth represent 12.*

According to the Rule above, I take the Division at the Figure 1. (in the middle of the Line of Numbers) for the first Figure of 12, the propounded Number; then for 2, the second Figure, I count two Tenths (or longer Stroaks) to the right-hand, from the said Stroak at 1; and this last is the Point representing 12, where (most commonly) is a small brass Center-pin, being oft in use.

Example 2. *Suppose the Point representing 22 on the Line of Numbers, were required to be found.*

The first Figure in the Number 22 being 2, I take the Division at the Figure 2 for it; and for the second Figure

gure being 2, I count 2 Tenths onwards; and that is the Point representing 22, at which (in some Gunter's) is a brass Center-pin.

Example 3. I desire to know the Point on the Line of Numbers that doth represent 144.

The first Figure being 1, I take the Division at the middle 1 for it; the Second Figure being 4, I count 4 Tenths onwards; from thence count 4 Centesims further for the third and last Figure; this last place is the Point representing 144.

Example 4. Let it be required to find on the Line of Numbers, the Point representing 1728.

For the first Figure 1, take the middle 1; for the second Figure 7, count as before onward 7 Tenths, and that is 700; then for 2, the third Figure, count 2 Centesims from the last, and it represents 20; lastly for the fourth Figure 8, Estimate 8 thousand Parts from the last. This Point last found, representeth 1728.

PROBLEM II. *To find a Fraction, or broken Number, on the Line of Numbers.*

THE Fractions to be found on this Line, ought always to be Decimal; as these, 1, 0, 001; 2, 02, 002, &c. That is, $\frac{1}{10}$, $\frac{1}{100}$, $\frac{1}{1000}$; $\frac{2}{10}$, $\frac{2}{100}$, $\frac{2}{1000}$, &c. either of Inches, Feet, Yards, Miles, or the like; also in Weight, or Time, or any other Denomination whatsoever.

So that all other Fractions must be reduced into Decimals, before they can be found on the Line of Numbers; and being so reduced, they are expressed and found upon this Line, as whole Numbers, by the Rule in Problem 1. and needs no Examples.

M 2

PROB.

Problem III. To perform Multiplication by the Line of Numbers.

The Rule is ;

AS 1 is to the Multiplier, so is the Multiplicand to the Product.

Now to Work this or any Proportion on the Gunter, this is a General Rule.

1. Extend the Compasses from the first Term, to the second Term.
2. That Extent (in the Compasses) laid the same way from the third Term, will reach to the fourth Term, or Thing required.

By the Sliding Gunter, thus ;

1. Set the first Term (counted on the Sliding or middle piece) right against the second Term, counted on the fixed piece.
2. Then seek the third Term, (always on the same piece the first Term was counted) on the sliding part; and against it, on the fixed part, is the fourth Term or Thing required.

Example 1. *What is the Product of 8 Multiplied by 4.*

The Analogy, or Proportion, is this ;

As 1 is to 8, so is 4 to the Product.

Or it is thus; As 1 is to 4, so is 8 to the Product.

1. By the Gunter with Compasses, thus.

Extend the Compasses from 1 to 8 ; that Extent set from 4 (the same way) reacheth to 32, the Product of 8 multiplied by 4.

Or

Or, the Extent from 1 to 4, being laid from 8, reacheth to 32, the Product as before.

2. *By the Sliding Gunter:*

Set 1 (at the beginning on the middle or Sliding piece) right against 8 (on the fixed or outside piece) then against 4 (on the first) is 32 (on the second) the Product required.

Or set 1 (as before) against 4; then against 8 (on the first) is 32 (on the second) the Product, as before.

Examp. 2. *What is the Product of 16 Multiplied by 5?*

The Proportion to work it by is this:

As 1 is to 5, so is 16 to the Product.

1. *By Gunter with Compasses, thus;*

The Extent from 1 to 5, being laid from 16, reacheth to 80, the Product required.

2. *By the Sliding Gunter, thus:*

Set 1 (on the middle piece) against 5 (on the outside piece) then against 16 (on the first) is 80 (on the second) the Product required.

PROB. IV. *To perform Division by the Line of Numbers.*

The Rule or Proportion is this;

AS the Divisor is to 1, so is the Dividend to the Quotient.

Example 1. *If the Dividend be 64, and the Divisor 4, What is the Quotient.*

To do this, the Proportion is: As 4 is to 1, so is 64 to the Quotient Required.

1. *By Gunter with Compasses, thus;*

The Extent from 4 to 1; laid (the same way) from 64, reacheth to 16, the Quotient required.

M 3

By

2. By Sliding Gunter, thus;

Set 4 (on the middle piece) against 1 (on the outside piece) then against 64 (on the first) is 16 (on the second) which is the Quotient required.

Example 2. How often is 144 contained in 1728.

To do this, the Proportion is this: As 144 is to 1; so is 1728 to the Answer

1. By Gunter with Compasses, thus;

The Extent from 144 to 1; reacheth from 1728 to 12, the Quotient or Answer required.

2. By Sliding Gunter, thus;

Set 144 (on the middle piece) against 1 (on the outside piece) then against 1728 (on the first) is 12 (on the second) which is the Quotient required.

PROB. V. To Reduce a Vulgar Fraction to a Decimal, by the Line of Numbers.

To perform this, the Proportion is thus;

AS the Denominator of the given Fraction, is to its Numerator; so is 1 to the Decimal Fraction required

Example. Suppose it be required to Reduce $\frac{3}{4}$ (a Vulgar Fraction) into a Decimal Fraction?

Note, A Decimal Fraction hath for its Denominator an Unit, with as many Cyphers as its Numerator hath Places: And the Proportion to find its Numerator, is thus: As 4 is to 3, so is 1 to the Numerator of the Decimal Fraction required.

1. By Gunter with Compasses thus;

The Extent from 4 to 3, reacheth (the same way) from 1 to .75, or $\frac{3}{4}$, the Decimal Fraction required.

2. By

2. *By Sliding Gunter; thus;*

Set 4 (on the middle piece) against 3 (on the outside piece) then against 1 (on the first) is 75, or $\frac{75}{100}$, on the second, the Decimal Fraction required to be found: So that 75 or $\frac{75}{100}$ is equal in value to $\frac{3}{4}$.

PROBLEM VI. *Of Continual Proportion, or Geometrical Progression; which is unto two given Numbers. To find a 3d, 4th, 5th, &c. Number, in a continual Proportion, by the Line of Numbers.*

The Analogy by which it is effected, is this:

AS the first Number given is to the second, so is the second to a third; and so is that third to a fourth; and so is that fourth to a fifth, &c.

Example. *Let the two Numbers given be 2 and 4, unto which it's required to find a third, a fourth Proportional, &c.*

For the Performance hereof, the Rule is thus:

As 2 is to 4, so is 4 to a third, so is that third to a fourth, &c.

1. *By Gunter with Compasses, thus:*

The Extent from 2 to 4, reaches from 4 to 8, the third; and from 8 to 16, the fourth; and from 16 to 32, the fifth Proportional Number, and so on to as many as you please: So that 2, 4, 8, 16, 32, &c. are Numbers in continued Proportion Geometrical, as was required.

2. *By Sliding Gunter, thus;*

Set 2 (on the middle piece) to 4 (on the next side piece) then against 4 (on the first) is 8 (on the second) for the third Proportional; and against 8 (on the first) is 16 (on the second) the fourth Proportional; and in like manner against 16, is 32 the fifth Proportional, as was required: And so on for more.

M 4

PROB.

PROB. VII. Of the Rule of Three direct, or 3 Numbers given; to find a 4th in direct Proportion, by the Line of Numbers.

The Analogy whereby this is performed, is thus:

AS the first Number is to the second, so is the third to the fourth Number required.

Example 1. If the Diameter of a Circle be 7 Inches, and the Circumference thereof 22, What is the Circumference of a Circle, whose Diameter is 14 Inches?

To perform this, the Analogy is thus: As 7 is to 22, so is 14 to the Circumference required.

1. By Gunter with Compasses, thus:

The Extent from 7 to 22, laid (the same way) from 14, will reach to 44, the Circumference of the Circle whose Diameter is 14; which was required.

2. By Sliding Gunter, thus;

Set 7 (on the middle piece) against 22 (on the outside piece) then against 14 (on the first) is 22 (on the second) which is the Circumference required.

Example 2. If the Circumference of a Circle be 3.14, and its Diameter 1, What will the Diameter of another Circle be, whose Circumference is 44?

The Proportion is: As 3.14 is to 1, so is 44 to the Diameter required,

1. By Gunter with Compasses, thus;

The Extent from 3.14 to 1, reacheth from 44 to 14 the Diameter required.

2. By Sliding Gunter, thus;

Bring 3.14 (on the middle piece) right against 1 (on the outside piece) and then against 44 (on the first) is 14 (on the second) which is the Diameter required.

Nota

Note, In the Rule of Three Direct; If the third Number be greater than the first, then will the fourth Number be greater than the second: But,

If the third Number be less than the first, then the fourth will be less than the second.

Example 3. If 30 Acres of Land be worth 25 Pounds a Year; How much a Year will 54 Acres be worth?

To do this, or any Question in the Rule of Three, always in Proportion, let the first and third Numbers or Terms be of one Kind or Denomination: And in this it is.

As 30 Acres is to 25 Pound, so is 54 Acres to 45 Pound.

1. By Gunter with Compasses, thus:

The Extent from 30 to 25, reacheth from 54 to 45, the yearly Rent required.

2. Also, by Sliding Gunter, it's thus:

Bring 30 against 25, then against 54 (on the first) is 45 (on the second) as before.

By this time the Reader is so well acquainted in the way of working a Proportion on the Line of Numbers, with Compasses, or without; that it's a needless thing to express it in words, being ever the same: Henceforward you shall have only the Proportion set down, leaving the manner of its Operation to your Practice, except in case where the working differs from what went before.

PROB. VIII. Of the Rule of Proportion Inverse, or Three Numbers given; to find a fourth in an Inverse Proportion (or in the backward Rule of Three) by the Line of Numbers.

1. IN this Rule you must note; if the third Number be greater than the first, then will the fourth be less than the second: But,

2. If

2. If the third be less than the first, the fourth is to be greater than the second.

3. And to resolve Questions of the backward Rule of Three, the Proportion is thus:

As the third Number is to the second, so is the first to the fourth.

Example. If 72 Pointers make a Trench in 48 Hours, in how long time can 54 Pointers make it?

By the Directions above, this is the Proportion: As 54 Men is to 48 Hours, so is 72 Men to 64 Hours, the Answer to the Question: From whence you may conclude that 54 Men will perform as much in 64 Hours as 72 Men in 48 Hours.

PROB. IX. *Of Duplicate Proportion, or Three Numbers given, to find a fourth in a Duplicate Proportion, by the Line of Numbers.*

THIS Rule is chiefly used in Proportions of Lines, to Superficies, &c. Wherein the first and second Terms are to be of one Kind or Denomination.

Example 1. If the Diameter of a Circle be 1, and its Area or Content 0.78539; What's the Content of a Circle whose Diameter is 14?

To perform this, the first and second Terms (by the Note above) are to be Lines; that is, the Diameters given; and then the Proportion is thus: As 1 is to 14, so is 0.785, to a fourth; and so is that fourth, to the Content required.

1. *By Gunter with Compasses, it's thus:*

The Extent from 1 to 14, reacheth from 0.785 to 11, and the same Extent laid (the same way) from 11, reacheth to 154, the Content required.

2. By

2. By the Sliding Gunter, it's thus:

Bring 1 (on the middle piece) right against 14 (on the outside piece) then against 0.785 (on the first) is 11 (on the second) and against 11 (on the first) is 154 (on the second) the Content required.

Example 2. If the Diameter of a Circle be 7, and its Area 38.5; What is the Area of a Circle, whose Diameter is 12? Answer 113. For,

As 7 is to 12, so is 38.5 to 66, and so is 66 to 113; the Area Required.

Example 3. If the Diameter of a Circle be 1, and its Area 0.78539, What is the Diameter of a Circle, whose Area is 154? Answer 14 is its Diameter.

In this the Proportion is of Superficies to Lines, which is thus: As Area 0.785 is to Area 154, so is square of Diameter 1, to square of Diameter required.

1. By Gunter with Compasses, it's thus:

The Extent from 0.785 to 154, reacheth from 1 to 96, the Square of the Diameter required.

Then divide the Space between 1 (always the middle, if the Number of Places be odd, but if even, the first) and 96, into two equal parts, the foot (of the Compasses) in the middle resteth at 14, the Diameter of the Circle, whose Area is 154.

2. By the Sliding Gunter, it's thus:

Bring 0.785 against 154, and against 1 (on the first) 96 (on the second) then find the middle between 1 and 96, which is at 14, the Diameter as before.

Example 4 The Diameter of a Circle being 1, and its Area 0.785; What is the Diameter of a Circle, whose Area is 113? Answer 12, is the Diameter required.

For as 0.785, is to 113, so is 1 to 144, the middle between it and 1, is at 12, the Diameter required.

PROB.

PROB. X. *Of Triplicate Proportion, or Three Numbers given; to find a Fourth in a Triplicate Proportion, by the Line of Numbers.*

THIS Problem concerneth the Proportion of Lines to Solids, and the contrary: in which evermore make the first and second Term to be of one Denomination.

Example 1. *If an Iron Bullet weigh 9 Pounds, and its Diameter is 4 Inches, What is the weight of another Iron Bullet, whose Diameter is 6 Inches?*

To perform this, the first and second Terms are to be Lines; that is, the given Diameters, and then the Proportion is thus;

As 4 is to 6, so is 9 to 13.5; and so is 13.5 to 20.2; and so is 20.2 to 30.3; that is 30 Pounds, &c. Tenths of a Pound; which is the Weight required.

1. That is, *By Gunter with Compasses, it's thus:*

The Extent from 4 to 6, being laid 3 times from 9, will reach to 30 Pounds 3 Tenths, the Weight required.

2. And, *By Sliding Gunter, thus:*

Set 4 against 6, and against 9 (on the First) is 13.5 (on the Second) then against 13.5 on the First, is 20.2 on the Second: and against 20.2 on the First, is 30.3 on the Second; that is 30 Pounds 3 Tenths, as before.

Example 2. *If an Iron Bullet, 1 Inch Diameter, Weighs c. 1406 Parts; What is the weight of another, whose Diameter is 4 Inches, it being of the same Metal? Answer, 9 Pounds. For,*

As 1 is to 4, so is 0.1406 to 0.562; and so is 0.562 to 2.25; and so is 2.25 to 9 Pounds, the weight required.

Example

Example 3. If a Gun 6 Inches Bore require 11 Pound of Powder; How much will serve a Gun 4 Inches Bore? Answer, Pounds 3.25 parts. For, As 6 to 4, so is 11 to 7.3; and so is 7.3 to 4.88; and so is 4.88 to 3.25; which is Pounds 3.25 Parts of a Pound, or Pounds $3\frac{1}{4}$ of Powder.

Example 4. If an Iron Bullet 1 Inch Diameter weigh Pound 0.1406 parts; What Diameter shall that be which weigheth 9 Pound of the same Metal? Answer, 4 Inches. For it's thus: (As 0.1406 is to 9, so is 1 to 64, the Cube of the Diameter required: then divide the space between 1 and 64 into 3 equal parts, and the Foot (of the Compasses) in the first $\frac{1}{3}$ part (from 1) reacheth to 4, the Diameter of the Iron-shot weighing 9 Pounds.

II. The Use of the Line of Numbers (commonly called Gunter's Line) in measuring Superficies, as Board, Glass, Land, &c.

PROB. I. The Length and Breadth of any Square, or Long Square Superficies given; to find the Area or Content thereof.

THE Proportion is this: As 1 to the Breadth, so is the Length to the Content.

Example 1. A plain Superficies, as a Board or Plank given to be measured: the Breadth thereof is 15 Inches, and its Length 61 Inches: What is the Content of it? Answer, 915 Inches. For, As 1 is to 15, so is 61 to 915 inches; the Content required.

Note, Such as the Breadth and Length is, such is the Content: so that if the Breadth and Length be Feet, the Content is Feet; if Perches, then Perches, &c.

Example

Example 2. A piece of Wallscot, in form of a Square, whose Length is Feet 15.5 Parts, and Breadth 2.25 Parts: What is the Content? Answer, Feet 34.87, Content required.

PROBLEM II. The Breadth and Length of a Superficial given in one kind of Measure; to find the Content thereof in another kind of Measure.

TO do this, the Proportion is thus: As the one kind of Measure is to the Breadth, so is the Length, to the Content desired.

Example 3. A Plank or Board 15 Inches broad, 61 Inches long; I demand the Content of it in Feet? Answer, Feet 6.35 Parts of a Foot. For you must Note,

In a Foot Superficial, or a Square Foot, is 144 Square Inches, and therefore the Proportion is thus: As 144 to 15 Inches, so is 61 Inches to Feet 6.35 Parts of a Foot.

Example 4. A piece of Land, in form a Long Square, whose Breadth being 30 Perches, Length 183 Perches; What is the Content in Acres? Answer, Acres 34.43 Parts.

For 160 Perches is an Acre, and the Proportion is thus:

As 160 is to 30 Perches, so is 183 Perches to Acres 34.43 parts of an Acre.

Example 5. A piece of Painting, in form a Long Square, whose Breadth is Feet 3.5 and Length 21 Feet; How many Square Yards is the Content? Answer, Yards 8.16 Parts of a Yard.

For 9 Feet being a Yard Square, the Proportion is thus:

As 9 is to 3.5 Feet, so is 21 Feet to Yards 8.16 Parts of a Yard.

PROBLEM III.

PROB. III. The Breadth of a Superficies given in one kind of Measure, and the Length in another; to find the Content in the greater Measure.

TO do this, the Proportion is thus: As the greater Measure is to the Breadth, so is the Length to the Content required.

Example 6. Admit a Board 10 Inches Broad, and 20 Feet long, I demand the Content in Feet? Answer, Feet 16.6 Tenths of a Foot.

For the Proportion is thus: As 12 is to 10 Inches, so is 20 Feet to Feet 16.6 Tenths.

Example 7. If a Board or Plank be 15 Inches Broad, and 27 Feet Long; What is the Content of it in Feet? Answer, Feet 33.75 parts of a Foot, or $33\frac{3}{4}$ Feet. For it is:

As 12 is to 15 Inches, so is 27 Feet to Feet 33.75 parts

Example 8. A Board $7\frac{1}{2}$ Inches broad, and 29 $\frac{1}{2}$ Feet long; What's the Content in Feet? Answer, Feet 18.3 Tenths. For it's: As 12 is to $7\frac{1}{2}$; so is 29.25 to Feet 18.3 Tenths.

Example 9. A Piece of Land (in form a Long Square) whose Breadth is 30 Perches, and length is Chains 15.25 Links (measured by a Chain of 3 Perches in 100 Links) I demand the Content thereof in Acres? Answer, Acres 11.4 Tenths. For it's: As 40 is to 30 Perches; so is Chains 5.25; to Acres 11.4 Tenths of an Acre.

PROB. IV. The Breadth of a Superficies given; to find how much in Length will make a Foot, a Yard, a Perch, or an Acre, &c.

TO do this, take this General Rule: As the Breadth is to a Foot, (a Yard, &c.) so is a Foot (a Yard &c.) to the length, which will make a Foot, (a Yard, &c.)

Example

Example 10. If a Board be $7\frac{1}{2}$ Inches broad, How much in length will make a Foot square? Answer, Inches 19.2 Tenths of an Inch.

For the Proportion is thus: As 7 5 is to 12, so is 12 to Inches 19.2 Tenths.

Example 11. A Plank 30 Inches Broad; How much in length will make a Foot? Answer, Inches 4.8 tenths of an Inch.

For it's: As 30 Inches is to 12, so is 12 to Inches 4.8 Tenths.

Example 12. A Pane of Glass bring in Breadth Feet 2.5 Tenths; How much in Length will make a Foot? Answer, 4 Tenths of a Foot. For it is thus:

As 2.5 is to 1 Foot, so is 1 Foot to 0.4 Tenths of a Foot.

Example 13. A Piece of Matting being 27 Inches broad, How much in length will make a Yard square? Answer 48 Inches or 4 Feet: For it is thus:

As 27 Inches is to 36 Inches, so is 36 Inches to 48 Inches: But if the Breadth be given in Feet; that is, for 27 Inches, it be $2\frac{1}{4}$ Feet, or 2.25 Feet. Then it is thus

As 2.25 is to 3 Feet, so is 3 Feet to 4 Feet in length, to make a Yard Square.

PROB. V. The Diameter of a Circle given; to find the Circumference.

THE Analogy or Proportion is thus: As 1 is to 3.142, so is the Diameter to its Circumference.

Example 14. If the Diameter of a Circle be 15 Inches, What is the Circumference of it? Answer, Inches 47.13 Parts of an Inch.

For as 1 is to 3.142, so is 15 Inches to Inches 47.13 Parts.

PROB

PROB. VI. *The Circumference of a Circle given, to find its Diameter.*

THE Proportion stands thus: As 3.142 is to 1, so is the Circumference to its Diameter.

Example 15. *The Circumference of a Circle being 44 Feet, What is the Diameter thereof? Answer, Feet, 14.* For it's As 3.142 is to 1, so is 44 Feet to Feet 14.

PROB. VII. *The Diameter of a Circle being given to find its Superficial Content?*

The Analogy is thus:

AS 1 is to the Diameter, so is 0.7854 to a fourth Number, and so is that fourth Number to the Superficial Content required.

Example 16. *The Diameter of a Circle being 15 Inches, What is the Content of it? Answer, Inches 176.7 Tenths.*

For it's as 1 is to 15, so is 0.7854 to 11.78; and so 11.78 to 176.7 the Superficial Content required.

PROB. VIII. *The Circumference of a Circle being given to find the Superficial Content of it.*

The Proportion is this:

AS 1 is to the Circumference, so is 0.07958 to a 4th Number, and so is that fourth Number to the Superficial Content required.

Example 17. *If the Circumference of a Circle be 44 Inches, What's the Content? Answer, Inches 154.06 parts of an Inch.* For it's,

As 1 is to 44, so is 0.07958 to 3.5; and so is 3.5 to Inches 154.06 parts the Content required.

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III. The Use of the Line of Numbers in Solid Measure, such as Timber, Stone, Guaging, &c.

PROB. I. The Side of a Square Solid given in Inches, to find how much in Length will make a Foot Solid.

THE Proportion is thus: As the given Side is to 12, so is 12 to a fourth Number; and so is that fourth Number to the length required to make a Foot Solid.

Example. 1. A Square Piece of Timber, or Stone, whose Breadth and Depth, each 8 Inches; How much in Length will make a Foot solid? Answer 27 Inches, or 2 Feet 3 Inches: For it's as 8 is to 12, so is 12 to 18; and so is 18 to 27 Inches.

Example 2. A Square Piece of Timber, or Stone, whose side is 2 Feet, or 24 Inches; How much in Length will make a Foot? Answer, 3 Inches. For it's as 24 is to 12, so is 12 to 6; and so is 6 to 3 Inches.

PROB. II. The Side of a Square Solid given in Foot measure (which is the Decimal Foot, or a Foot divided into 100 equal Parts,) to find how much in Length will make a Foot Solid.

THE Proportion is thus: As the given Side is to 1, so is 1 to a fourth Number; and so is that fourth Number to the Length Required to make a Foot solid.

Example 3. A Square piece of Timber, whose side is Feet 1.52 Parts; How much in Length will make a Foot-solid? Answer, 0.432 Parts of a Foot. For it's as 1.52 is to 1, so is 1 to 0.658; and so is 0.658 to 0.432 Parts of a Foot.

PROB.

PROB. III. *The Breadth and Depth of a Solid, whose two Ends are equal Long Squares, being given in Inches, or in Foot measure; to find how much in Length will make a Foot solid.*

1. **T**HE Proportion for Inches is thus: As 12 is to the Breadth, so is the Depth to a fourth Number: Then,

As that fourth Number is to 12, so is 12 to the Length in Inches to make a Foot solid.

2. The Proportion for Foot measure thus: As 1 is to the Breadth, so is the Depth to the fourth Number. Then say, As that fourth Number is to 1, so is 1 to the Length in Foot measure to make a Foot solid.

Example 4. *A piece of Timber, or Stone, whose Breadth is 11 Inches, and Depth 19 Inches; How much in Length will make a Foot? Answer, Inches 8.27 Parts. For it's as 12 is to 11, so is 19 to 17.4: And then say, as 17.4 is to 12, so is 12 to Inches 8.27 Parts in Length to make a Foot solid.*

Example 5. *A Piece of Timber, in Breadth Foot 0.75 Parts, and Depth Foot 1.25 Parts; How much in Length will make a Foot solid? Answer, Foot 1.06 Parts. For it's as 1 is to 0.75, so is 1.25 to 0.94: Then say, as 0.94 is to 1, so is 1 to Foot 1.06 Parts in length to make a Foot solid.*

PROB. IV. *The Side of a Square Solid, and its Length being given; to find the Content.*

1. **W**hen the Side is given in Inches, and Length in Feet, the Proportion is thus. As 12 is to the given Side, so is the Length to a fourth Number; and so that fourth Number to the Content in Feet.

2. When the Side and Length are both given in Foot measure, the Proportion is thus As 1 is to the given Side, so is the Length to a fourth Number; and so is that fourth Number to the Content required.

Example 6. *A Square Piece of Timber, whose Side is 9 Inches, and Length 35 Feet; How many Feet of Timber is it?* Answer, *Feet 19.68 Parts.* For it is,

As 12 is to 9, so is 35 to 26.3; and so is 26.3 to Feet 19.68 Parts, the Content required.

Example 7. *A Piece of Timber 16 Inches Square, and 28 Feet long; How much is the Content?* Answer, *50 Feet.* For it's as 12 is to 16, so is 28 to 37.3; and so is 37.3 to 50 Feet.

Example 8. *A Stone, Feet 2.75 Parts Square, and Feet 7.50 Parts long; How much is the Content?* Answer, *Feet 56.72 Parts.* For it's as 1 is to 2.75, so is 7.50, to 20.6; and so is 20.6 to Feet 56.72 parts the Content required.

PROB. V. *The Length, Breadth, and Depth of a Square Solid being given, to find the Solid Content.*

1. IF the Breadth and Depth be given in Inches, and the Length in Feet, the Proportion is thus: As 12 is to the Breadth, so is the Depth to a fourth Number. Then say, as 12 is to that fourth Number, so is the length in Feet to the Content in Feet.

2. When the Length, Breadth, and Depth, are all given in Foot measure, then the Proportion is thus: As 1 is to the Breadth, so is the Depth to a fourth Number. And then again say, as 1 is to that fourth Number, so is the Length to the Content in Feet.

Example 9. *If a Square Piece of Timber be in Breadth 19 Inches, Depth 11 Inches, and 20 Feet long; How much is the Solid Content?* Answer, *Feet 29.03 Parts.* For it's thus: As 12 is to 19, so is 11 to 17.4. Then say, as 12

is to 17 4, so is 20 to Feet 29 03 parts; the Content required.

Example 10. *A Stone 20 Inches broad, 13 Inches Deep, and Feet 15 25 or 15 $\frac{1}{2}$ Feet in Length; How much is the Content?* Answer, Feet 27.5 or 27 $\frac{1}{2}$ Feet. For it's: As 12 is to 20, so is 13 to 21.67. And then: As 12 is to 21.67, so is 13.25 to 27.5, that is 27 $\frac{1}{2}$ Feet.

Example 11. *A squar'd Piece of Timber, Feet 1.25 broad, Feet 0.56 deep, and 36 Feet long; How much is the Content?* Answer, Feet 25 20 Parts, or 25 $\frac{2}{5}$ Feet. For it is, As 1 is to 1.25, so is 0.56 to 0.7. And then say, As 1 is to 0.7, so is 36 to Feet 25 2 Tenths.

PROB. VI. *The Diameter of a Cylinder given, to find how much in Length will make a Foot-solid.*

1. **IF** the Diameter be given in Inches, the Proportion is thus: As the given Diameter is to 13.531, so is 12 to a fourth Number, and so is that fourth Number to the Length required to make a Foot solid

2. When the Diameter is given in Foot-measure, the Proportion is thus; As the given Diameter is to 1.128, so is 1 to a fourth Number, and so is that fourth Number to the Length, which will make a Foot-solid.

Example 12. *A round Piece of Timber, or Stone, being 15 Inches Diameter; How much in Length will make a Foot-solid?* Answer, Inches 9.78 parts of an Inch. For it's:

As 15 is to 13.531, so is 12 to 10.82, and so is 10.82 to Inches 9.76 parts, or 9 $\frac{3}{4}$ Inches: But supposing the Diameter of the same to be taken in Foot-measure, then its Foot 1.25 Parts, Now how much will make a Foot? Answer, Foot 0.81 parts of a Foot. For it's thus: As 1.25 is to 1.128, so is 1 to 0.902, and so is 0.902 to Foot 0.815 Parts, or 1 $\frac{1}{12}$ Foot.

PROB. VII. *The Circumference of a Cylinder given; to find how much in Length will make a Foot solid?*

1. **WHEN** the Circumference is given in Inches, the Proportion is;

As the Circumference is to 42.54, so is 12 to a fourth Number; and so is that 4th Number to the Length requir'd to make a Foot-solid.

2. But if the Circumference be given in Foot-measure, then the Proportion is;

As the Circumference is to 3.545, so is 1 to a fourth Number; and so is that fourth Number to the Length, to make a Foot solid.

Examp. 13. *If a round Stone, or Tree, be 44 Inches about; How much in Length will make a Foot? Answer, Inches 11.22 Parts. For it is,*

As 44 to 42.54, so is 12 to 11.6; and so is 11.6 to Inches 11.22 parts of an Inch, or 11 $\frac{11}{50}$ Inches.

But suppose the same was measured by Foot measure, and the Circumference found to be Feet 3.67 parts; How much in Length will make a Foot? *Answer, Foot 0.935 parts. For it is thus;*

As 3.67 is 3.545, so is 1 to 0.966; and so is 0.966 to Foot 0.935 parts or $1\frac{11}{50}$ Foot.

PROB. VIII. *The Diameter and Length of a Cylinder given; to find its solid Content.*

1. **WHEN** the Diameter is given in Inches, and Length in Feet, the Proportion is thus,

As 13.531 is to the Diameter, so is the Length to a 4th Number; and so is that 4th Number to the solid Content in Feet.

2. If the Diameter and Length are both given in Foot-measure, then the Proportion is thus;

As 1.128 is to the Diameter, so is the Length to a fourth Number; and so is that fourth Number to the Content required.

Example 14. *A round piece of Timber 10 Inches through, and 30 Feet long. How many Feet of Timber is in it? Answer, Feet 16.38 Parts.* For it's as 13.131 is to 10, so is 30 to 22.16; and so is 22.16 to Feet 16.38 Parts of a Foot, or $16 \frac{1}{2}$ Feet.

But suppose the same Piece measured by Foot Measure, then it's Foot 0 83 Parts through. And the Work is thus:

As 1.128 is to 83, so is 30 to 22.16; and so is 22.16 to Feet 16.38 Parts, or $16 \frac{1}{2}$ Feet as before.

PROBLEM IX *The Circumference and Length of a Cylinder given; to find the Solid Content.*

1 IF the Circumference be given in Inches, and Length in Feet, the Proportion is thus: As 42.54 is to the Circumference, so is the Length to a fourth Number; and so is this fourth Number to the Solid Content in Feet.

2. When the Circumference and Length are both in Foot Measure, the First Term being 3.545 (instead of 42.54) the former Words will serve here.

Example 15. *A Round Stone, or Tree, being 30 Inches about, and 25 Feet Long; How many Feet solid are in it? Answer, Feet 12.43 Parts.* For it's thus: As 42.54 is to 30, so is 25 to 17.63; and so is 17.63 to Feet 12.43 Parts, or $12 \frac{1}{2}$ Feet.

Now the Compass about being taken in Foot Measure is Feet 2.50 Parts. And the Proportion is: As 3.545, to 2.50, so is 25 to 17.63; and so is 17.63 to Feet 12.43 Parts, or $12 \frac{1}{2}$ Feet as before.

Note 1. When Timber tapers; that is, it's bigger at one End than t'other, it's usual to take the Breadth and Depth in the middle of its Length; and by them to measure the Piece as if it were both Ends of a bigness.

Note 2. The Proportions for Foot Measure, are the same when all the Dimensions are taken in Inches; only then the Solid Content found is Inches.

Note 3. The Solid Content in Inches, divided by 1728, the Quotient is Feet; but if divided by 282, or 231, the first is Beer, and the latter is Wine Gallons: And how to divide by the Line of Numbers was shewed in Problem 4 of the First Uses of the Gunter in Page 181.

PROBLEM X. The Diameter of a Cask at Head, and Bung, and also its Length given in Inches; to find its Contents in Gallons, Beer or Wine.

The Rule is thus,

1. **A**S I is to 0.7, so is the Difference of Bung and Head Diameters, to a fourth Number: which being added to the Head Diameter, the Sum is a Mean Diameter, reducing the Cask to a Cylinder. Then say,

2. As the Gauge Point (which for Beer or Ale is 18.95, but for Wine is 17.15) is to the Mean Diameter; so is the Length to a fourth Number; and so is this fourth Number, to the Content in Gallons required.

Example 16. Suppose a Cask whose Length is—40

The Diameter at _____ { Bung 28 } Inch.
 { Head 20 }

What's the Content of this Cask in Gallons, Beer, or Wine?

What's the Content of this Cask in Gallons, Beer, or Wine?
Answer, 73 Gallons Beer, and Wine Gallons 89.1 Tenth.

Answer, 73 Gallons Beer, and Wine Gallons 89.1 Tenth.

See the Work following:

Bung Diameter ————— 28 Inches.

Head Diameter _____ 20 Inches.

Their Difference ————— 8 Inches.

Then As 1 is to 0.7, so is 8 to 5.6, which added to 20 the Head Diameter, makes 25.6 for the Mean Diameter: Then lay,

As $\left\{ \begin{array}{l} 18.95 \\ 17.15 \end{array} \right\}$ is to 25.6, so is 40 to $\left\{ \begin{array}{l} 54 \\ 59.71 \end{array} \right\}$ and so is $\left\{ \begin{array}{l} 54 \\ 59.71 \end{array} \right\}$ to $\left\{ \begin{array}{l} 73 \\ 89.1 \end{array} \right\}$ *Beer* } Gallons.

1. By Gunter with Compasses.

1. The Extent from 1 to 0.7, will reach the same way from 8 to 5.6; which being added to 20, (the *Head Diameter*) makes 25.6 for the *Mean Diameter*. Then,

2. The Extent from 18.95 (the *Gauge Point for Beer*) to 25.6, will reach from 40 to 54; and that Extent turned over again, reacheth to 73, the Content in *Beer Gallons*.

In like manner the Extent from 17.15 (the *Gauge Point for Wine*) to 25.6, being laid twice from 40, will reach to 89.1, the *Wine Gallons*.

2. By the Sliding Gunter.

1. Set 1 against 0.7, and against 8 on the First, is 5.6 on the Second; which added to 20 (the *Head Diameter*) makes 25.6 for the *Mean Diameter*. Then,

2. Set 18.95 (the *Gauge Point for Beer*) on the First, against 25.6 on the Second; then against 40 on the First is 54 on the Second; then against 54 on the First is 73 on the Second, the Content in *Beer Gallons*.

Also, if you set the *Gauge Point for Wine* 17.15, against the *Mean Diameter* 25.6, then against the Length of the Cask 40 on the First, on the Second you will find 59.71, and against 59.71 on the First, you'll find on the Second 89.1, the Content in *Wine Gallons*.

PROBLEM XI. The Length of a Ship's Keel, and Breadth as the Beam given to find her Tonnage.

IT's the Practice of the Shipwrights about London, to multiply the Length of the Keel Breadth, and Half-breadth into one another, and to divide the last Product by 94, whose Quotient they count for the Ship's Tonnage: from whence I frame this Proportion following, to be wrought by the Line of Numbers.

1. As

1. As 188 is to the Breadth, so is the Breadth to a fourth Number: Then say,

2. As 1 is to that fourth Number; so is the Length, to the Tunnage required.

Example 17 Suppose a Ship 72 Feet by the Keel, and 24 Feet by the Beam; I demand her Tunnage? Answer, Tuns 220.6 Tenths nearest. See the Work following:

As 188 is to 24, so is 24 to 3.06: And then,

As 1 is to 3.06, so is 72 to Tuns 220.6 Tenths.

1. By the Gunter with Compasses.

1. The Extent from the Given Number 188, to the Breadth of the Beam 24; will reach from (the said Breadth) 24 to 3.06. Then,

2. The Extent from 1 to 3.06, will reach from the Length of the Keel 72, to Tuns 220.6 Tenths, the Tunnage required.

Or more briefly thus: The Extent from 13.71, (which is the Square Root of the Given Number 188) to the Breadth of the Beam 24; being turned over twice from the Length of the Keel 72, reacheth to Tuns 220.6 Tenth as before.

2. By the sliding Gunter, thus:

1. Set the Given Number 188, against the Breadth of the Ship 24, and against the said Breadth 24 on the First, is 3.06 on the Second. Then,

2. Set 1 against 3.06, and against the Length of the Keel 72 on the First, is Tuns 220.6 Tenths on the Second, as before.

PROBLEM XII. To find the Tunnage of a Box, Bale, or Case, having its Length, Breadth, and Depth, given.

The Rule is thus:

1. AS 66 is to the Breadth, so is the Depth to a fourth Number. Then,

2. As 1 is to this fourth Number, so is the Length to its Tunnage required.

Example

Example 18. A Case, or Bale, being 6 Feet Broad, 4 Feet Deep, and 10 Feet Long, I demand its Tonnage? Answer, Tuns 3.63 Parts. For it is thus:

1. By Gunter's Scale with Compasses.

1. The Extent from the Given Number 66, to the Breadth 6, reacheth from the Depth 4 to 0.363. Then,

2. The Extent from 1 to the last found Number 0.363, being laid from the Length 10, reacheth to 3.63; that is, 3 Tun and 63 Parts of 100, or $3\frac{63}{100}$ Tuns.

2. By the Sliding Gunter, thus:

1. Set the Given Number 66, against the Breadth of the Bale or Case 6; then against the Depth of it 4 on the First, you will find 0.363 on the Second, a fourth Proportional Number. Then:

2. Set 1 against the said Proportional Number 0.363; then against the Length of the Bale or Case 10 on the First, you will find on the Second 3.63 or $3\frac{63}{100}$, the Tonnage of the Bale or Case proposed.

Note, That 66 Feet is the Content of a Case that will inclose 2 English Butts, but the Cantlings of them being better than $\frac{1}{2}$ part; therefore allowing 26 Feet for the Cantlings, the remaining 40 Feet is counted 1 Tun. And then the Rule is,

1. By Gunter with Compasses for the foresaid Example;

1. The Extent from the Given Number 40, to the Breadth of the Case or Bale 6, will reach from the Depth 4 to 0.6 a Fourth Proportional Number. Then:

2. The Extent from 1, to the said fourth Number 0.6 will reach the same way, from the Length 10, to 6 Tuns, the Content of the Case or Bale required.

2. By the Sliding Gunter, thus:

1. Set the (Given Number) 40, against the Breadth of the Bale or Case 6, then against the Depth of it 4, on the First you will find 0.6 on the Second, a fourth Proportional Number. Then:

2. Set

2. Set 1 against the said Proportional Number 0.6; then against the Length of the Bale or Case 10, on the First, you will find on the Second 6, the Tunnage of the Bale or Case proposed.

PROBLEM XIII. *The Diameter of a Globe given to find the Solid Content.*

The Rule.

AS 1. is to the Diameter; so is 0.5236, to a fourth Number; and so is that fourth Number to a fifth: and so is this fifth to its Solid Content required.

Example 19. *A Globe whose Diameter 8 Inches: What's the Solid Content? Answer, Inches 268. For it's wrought thus:*

As 1. is to 8; so is 0.5236, to 4.19; and so is 4.19, to 33.5; and so is 33.5, to 268 Inches, the Solid Content of the Globe.

IV. The Use of the Line of Numbers in Gunnery.

PROBLEM I. *The Diameter, and Weight of any Piece of Ordnance known; to find the Weight of any other, being of the same Metal and Shape, its Diameter being known.*

Like Solids are in Proportion, as the Cubes of their agreeing Sides. Therefore the Rule is thus:

AS the Diameter of the known Gun, is to the Diameter of the Gun whose Weight is required; so is the Weight of the known Gun, to a fourth Number; and so is that fourth to a fifth: and so is that fifth, to the Weight required.

Example 1. *Suppose a Brass Saker, whose Diameter is Inches 11.5 Tenths, do weigh 1900 Pounds; What will a Brass Gun weigh, whose Diameter is Inches 8.75. Parts? Answer 837 Pounds. For it's thus:*

1. *By Gunter's Scale with Compasses.*

The Extent from the Diameter 11.5. to the Diameter 8.75; being laid three times from the Weight 1900, will reach to 837 Pounds, the Weight of the Gun required. And,

2. *By*

2. By the Sliding Gunter, thus :

Set the Diameter 11.5 against the Diameter 8.75; then against the Weight 1900 on the First, is 1445 on the Second; and against 1445 on the First, is 1100 on the Second: Also against 1110 on the First, is 837 Pounds, the Weight required on the Second.

PROBLEM II. Having the Diameter and Weight of one Piece of Ordnance, and the Diameter of another Piece of another Metal; to find the Weight of the last, it being of the same Shape with the former.

The Rule is thus:

1. **FIND** the Weight of the Piece as if it had been of the same Metal the propounded Piece is, by the last Problem, in Page 204. Then,

2. Consider the Proportions of Metals; which are these, according to the best Authors :

Brass	} is to	Iron	} As	$\left\{ \begin{array}{l} 9 \\ 3 \\ 4 \\ 8 \end{array} \right\}$	} is to	8.
Lead		Iron				2.
Lead		Stone				1.
Iron		Stone				3.

3. Having the Weights of both Pieces in one sort of Metal, you must then Proportion their Weights according to their different Metals, by the Proportional Numbers of those Metals; and then it's done.

Example 2. If a Brass Saker of Inches 11.5 Tenths Diameter, weigh 1900: What will an Iron Gun (of the same Shape) weigh, whose Diameter is Inches 8.75 Parts? Answer, 744 Pounds. For it's wrought thus:

1. I Find by Problem 1 in Page 204, that a Brass Piece of Inches 8.75 Parts Diameter, will weigh 837 Pounds; but because this Piece is Iron, and the Proportion of Brass, to Iron (as abovesaid) is as 9 is to 8: Therefore say,

2. As 9 is to 8, so is 837 to 744 Pounds, the weight of the Iron Gun required.

PROB.

PROBLEM III. By knowing the Allowance of Powder for one Gun; to find how much of the same Powder is requisite for another Gun.

The Rule.

AS the Diameter of the Bore of the Gun whose Allowance is known, is to the Diameter (of the Gun whose Allowance is required; so is the Allowance given to a fourth Number; and so is that 4th to a 5th; and so is this 5th to the Allowance required.

But note; Here it's understood that both Guns are alike fortified; that is, they should have the same Proportion in Weight and Thickness of Metal.

Example 3. If a Saker of Inches 3.5 Tenths Bore, require 4 Pound of Powder; What will a Demi-Cannon of Inches 6.5 Tenths Bore require? Answer, Pounds 25.62 Parts. For it's thus:

As 3.5 is to 6.5, so is 4 to 7.44; and so is 7.44 to 13.80; and so is 13.80 to Pounds 25.62 Parts, the Weight of Powder for the Demi Cannon, in Proportion to the given Saker. But suppose the Weight of the Saker 1600, and the Weight of the Demi Cannon 6000. What Allowance of Powder must it then have?

1. By *Problem 1.* find the Weight of the Demi Cannon in Proportion to the Saker's Weight; which is thus:

As 3.5 is to 6.5, so is 1600 to 2971; and so is 2971 to 5517; and so is 5517 to 10246 Pounds, the Weight of the Demi Cannon requiring Pounds 25.62 Parts of Powder for its Loading. But seeing its Weight is supposed to be 6000; say,

2. As 10246 is to 6000, so is 25.62 to Pounds 15, the due Allowance of Powder for the Demi Cannon of Inches 6.5 Tenths Bore, and weighing 6000 Pounds; at the rate of a Saker Inches 3.5 Tenths Bore, weighing 1600 Pounds, doth require 4 Pounds of Powder.

PROB

PROB. IV. Having the Diameter and Weight of one Bullet, and the Diameter of another of the same Metal given, to find the Weight of the latter.

The Rule.

THE Weights of Bullets (of the same Metal) are in Triplicate Proportion of their Diameters, and wrought by the Directions in Problem 10, of the First Use of the Gunter, in Page 184 and 185.

Example 4. If an Iron Bullet, 4 Inches Diameter, weigh Pounds; What will an Iron Bullet of 6 Inches Diameter weigh? Answer, Pounds 30.4 Tenths. For it is thus:

As 4 is to 6, so is 9 to 13.5; and so is 13.5 to 20.25; and so is 20.25 to Pounds 30.4 Tenths.

PROB. V Two Bullets equal in Diameter, but of differing Metal, by the Diameter and Weight of one; to find the Weight of the other.

The Rule.

AS the Proportion of one Metal is to the other; so is the Weight of the given Bullet, to the Weight of the Bullet required.

Example 5 Suppose an Iron Bullet, 6 Inches Diameter, weigh Pounds 30.4 Tenths; What will a Stone Bullet of the same Diameter weigh? Answer, Pounds 11.36 parts. For it is wrought thus:

By Problem 2 of Gunnery, (in Page 105) the Proportion of Iron and Stone is as 8 to 3; therefore say, As 8 is to 3, so is 30.4 to Pounds 11.39 Parts, Weight of the Stone Bullet.

PROB.

PROB. VI. Having the Diameter and Weight of a Bullet of one kind of Metal, and the Diameter of any Bullet of another Metal given; to find the Weight of the latter.

The Rule.

1. **F**IND the Weight of it (by Problem 4.) as if it were the same Metal.
2. Then find its Weight according to the Proportion of the Metals by the last Problem, and it's done.

Example 6. If an Iron Bullet 4 Inches Diameter, weigh 9 Pounds; What is the Weight of a Leaden Bullet, 6 Inches Diameter? Answer, Pounds 45.6 Parts. For it's thus wrought.

1. As 4 is to 6, so is 9 to 13.5; and so is 13.5 to 20.2; and so is 20.2 to Pounds 30.4 Tenths, if it had been Iron: But being it is Lead, say,
2. As 2 is to 3, so is 30.4 to Pounds 45.6 Parts, the Weight being Lead.

V. The Use of Gunter's Scale in Navigation; and first in Plain Sailing.

CASE I.

Course and Distance sailed given to find the Difference of Latitude and Departure from the Meridian.

To do this, the Proportions are these:

1. **A**S Radius is to the Distance Run, so is the Sine of the Course to the Departure from the Meridian.
 2. As Radius is to the Distance sailed; so is the Sine Complement of the Course to the Difference of Latitude.
- Note;* The Radius, according to the Nature of the Proportion, may be any of these. 8 Points

8 Points	} on the Line of	Sine Rumbs
4 Points		Tangent Rumbs
90 Degrees		Sines
45 Degrees		Tangents

And for conveniency that each Proportion may stand in one Line

Let S.	} stand for	Sine
S. c.		Sine Complement
T.		Tangent
T. c.		Tangent Complement
Cr.		Course
Dist.		Distance sailed
Diff. Lat.		Difference of Latitude
Dep.	}	Departure from the Meridian

Example. If a Ship sails S. W. by S. 104. Minutes from Latitude 1d. 45m. North; I demand what Latitude she is in, and her Departure from the Meridian?

As 8 Points, is to 104 M so is $\left\{ \begin{smallmatrix} 3 \\ 5 \end{smallmatrix} \right\}$ Points, to $\left\{ \begin{smallmatrix} \text{Dep. } 58 \text{ M} \\ \text{Diff. Lat } 86 \text{ M} \end{smallmatrix} \right\}$

1. By Gunter with Compasses.

The Extent from 8 Points (on the Line of Sine Rumbs) to 104 Min. (on the Line of Numbers) will reach (the same way) from 3 Points (on the Line of Sine Rumbs) to 58m. (on the Line of Numbers) which is the Departure from the Meridian: And the Compasses kept at the same Distance, will reach (the same way) from 5 Points (on the Line of Sine Rumbs) to 86 Minutes; (on the Line of Numbers) which is the Difference of Latitude.

Note; The Course is 3 Points, because S. W. by S. is 3 Points from the Meridian or South; and 5 Points is the Complement of the Course, because S. W. by S. is 5 Points from the Parallel or West: Understand the like in any other Course.

O

2. By

CASE III.

Course, and Departure from the Meridian given; to find the Distance Run, and Difference of Latitude.

This is performed by these Proportions.

1. As the Sine of the Course is to the Departure from the Meridian, so is Radius to the Distance Run.
2. As the Sine of the Course is to the Departure from the Meridian, so is the Sine Complement of the Course, to the Difference of Latitude.

Example. If a Ship sails S.E. by E. from 1 d. 10 m. North Latitude, till her Departure be 92 Minutes; What is her Distance sail'd, and Latitude she is in?

As S. 5 Points, to 92 M. so is S. $\left\{ \begin{smallmatrix} 8 \\ 3 \end{smallmatrix} \right\}$ Points, to $\left\{ \begin{smallmatrix} 110 \text{ Dist.} \\ 61 \text{ Diff. Lat.} \end{smallmatrix} \right\}$

Latitude departed from ————— 1 : 10 North
Difference of Latitude 61 Minutes, or — 1 : 01 South.
Subtract, giveth the Latit. Ship is in to be 0 : 09 North.

CASE IV.

Distance Run, and Difference of Latitude given; to find the Course, and Departure from the Meridian.

The Proportions are these:

1. As the Distance Run is to Radius, so is the Difference of Latitude to the Sine Complement of the Course.
2. As the Radius is to the Distance Run, so is the Sine of the Course to the Departure from the Meridian.

Example. Admit a Ship sails South Westward 98 Leagues from the Lizard, in 50 d. 00 m. North Latitude, and then, by Observation, is in 46 d. 30 m. North Latitude: What is her Course, and Departure from the Meridian.

O 2

D. M.

Latitude departed from ——— 50 : 00 North

Latitude by Observation ——— 46 : 30 North

The Difference of Latitude ——— 3 : 30 or 70 Leagues.

1. As 98 Leagues, is to Sine 90 Degrees, so is 70 Leagues to Sine 45d. 30m. whose Complement 44d. 30m. is the Course from the South Westward ; that is, South West nearest. Then,

2. As Sine 90 Degrees, is to 98 Leagues ; so is Sine 44d. 30m. to 68 Leagues, the Departure from the Meridian

1. *By Gunter with Compasses.*

1. The Extent from 98 Leag. (in the Line of Numbers) to 90 Degrees (in the Line of Sines) will reach the same way from 70 Leag. (in the Line of Numbers) to 45 deg. 30 minutes (in the Line of Sines) which being subtracted from 90 deg. leaves 44 deg. 30 minutes for the Course.

2 The Extent from 90 Degrees (in the Line of Sines) to 98 Leagues (in the Line of Numbers) will reach from 44 Degrees 30min (in the Line of Sines) to 86 Leagues (in the Line of Numbers) which is the Departure from the Meridian.

2. *By Sliding Gunter.*

1. Bring 98 Leagues (in the Line of Numbers, on the middle Piece) against 90 Degrees (in the Line of Sines, on the outside Piece ;) then right against 70 Leagues (on the First) is 45d. 30m. (on the Second) which is the Complement of the Course, and subtracted from 90d. is 44d. 30m. and is near 4 Points from the South towards the West, or South West.

2. And as it now stands against 44d. 30m (in the Line of Sines, on the outside Piece) is 68 Leagues (in the Line of Numbers, on the middle Piece) which is the Departure from the Meridian.

CASE V.

Distance Run, and Departure from the Meridian given ; to find the Course, and Difference of Latitude.

The

The Operations are as follows;

1. **A**S the Distance Run, is to Radius; so is the Departure, from the Meridian, to the Sine of the Course.
2. As Radius is to the Distance sailed, so is the Sine Complement of the Course, to the Difference of Latitude.

Example. A ship runneth 354 Minutes North Eastward, from 1d. 19m. South Latitude, until her Departure from the Meridian be 150 Minutes: What is her Course, and Latitude she is in?

1. As 354 Minutes, is to Sine 90 Deg. so is 150 Minutes, to Sine 25 Deg. the Course North Eastward, or N. N. E. $\frac{1}{4}$ E.

2. As S. 90 Degrees, is to 354 Minutes; so is S. 65 Degrees, to 323 Minutes, the Difference of Latitude.

D. M.

Latitude departed from is ——— 1 : 19 South
The Difference of Latit. 323 Minutes, or 5 : 23 North.
Subtract, gives the Latit. the Ship is in — 3 : 04 North

CASE VI. Difference of Latitude, and Departure from the Meridian given; to find the Course and Distance Run.

To do this, these are the Proportions.

1. **A**S the Difference of Latitude, is to the Departure from the Meridian; so is Radius, to the Tangent of the Course.

2. As the Sine of the Course, is to the Departure from the Meridian; so is Radius, to the Distance sailed.

Example. Sailing between the North and the West, from 1d. 59m. South Latitude, and then arriveth at another Port which is 3d. 08m. North Latitude; and is also 209 Minutes to the Westward of the First Port; I demand the Course, and Distance from the First Port to the Second?

O 3

D. M.

D. M.

Latitude of the first Port ————— 1 . 59 South.

Latitude of the second Port ————— 3 . 08 North.

Added, gives the Difference of Latit. — 5 . 07 or 307m

1. As 307 min. is to 209 min. so is Tangent 45 deg. to Tang. 34 deg. 15 min. the Course North Westward, or N. W. by N. nearest.

2. As S. 34 Deg. 15 Minutes, is to 209 Minutes; so is S. 90 Degrees, to 307 Minutes the Distance between the Ports.

1. By Gunter with Compasses.

1. The Extent from 307 Min. to 209 Min. (in the Line of Numbers) will reach from 45 Deg. (in the Line of Tangents, that now being the Radius) to 34 Degrees 15 Minutes (in the same Line of Tangents) which is the Course from the Meridian.

Note, When the Difference of Latitude is greatest, the Course is less than 45 Degrees from the Meridian.

But, when the Departure from the Meridian is greatest, the Course is more than 45 Deg. from the Meridian.

2. The Second Canon or Proportion for the Distance Run, is wrought as in Case the Third, or Case the Second.

2. By Sliding Gunter.

1. In this Case, so put in the middle Piece, that a Tangent Line may slide by and next a Tangent Line, also Numbers against Numbers: Then bring 307 Minutes (in the Line of Numbers on the middle Piece) against 209 Min. (in the Line of Numbers on the outside Piece; then against 45 Degrees (in the Line of Tangents on the middle Piece) is 34 Deg. 15 Minutes (in the Tangents on the outside Piece which is the Course required.

2. For the Distance, the manner of working is the same as hath been shewed in Case First, Second, and Third.

To

To Resolve a Traverse by Gunter's Scale.

Example 1. A Ship in 40 Degrees North Latitude, and in 5 Degrees 24 Minutes West Longitude, she sails first S. E. by S. 68 Minutes, then S. W. by W. 55 Minutes, and then W. N. W. 75 Minutes: I demand the Course and Distance from the first Place of Departure, and what Latitude and Longitude she now is in?

To do this, First find the Difference of Latitude, and Departure from the Meridian, for each several Course, as directed in Case 1. of Plain-Sailing, in Page 208, and 210.

2. Collect the several Differences of Latitude, whether North, or South, into one Sum; and in like manner, the several Departures, either East, or West: taking the Difference of the Northing and Southing, for the Difference of Latitude; and the Difference of the Easting and Westing, for the Departure from the Meridian.

3. Having now the Difference of Latitude, and the Departure from the Meridian known; the Course, and Distance may be found by the Sixth Case of Plain Sailing, in Page 213, and 214

4. The Difference of Longitude may be found by this Proportion;

As the Sine Complement of the Middle-Latitude, is to the Departure from the Meridian; so is Radius, to the Difference of Longitude. See the Work following.

	M	Pts. M.
1. Course. As S. 8 Points, is to 68, so is S.		$\left\{ \begin{array}{l} 3, \text{ to } 38 \text{ Easting.} \\ 5, \text{ to } 57 \text{ Southing.} \end{array} \right.$
2 Course. As S. 8 Points, is to 55, so is S.		$\left\{ \begin{array}{l} 5, \text{ to } 46 \text{ Westing.} \\ 3, \text{ to } 30.6 \text{ Southing} \end{array} \right.$
3. Course. As S. 8 Points, is to 75, so is S.		$\left\{ \begin{array}{l} 6, \text{ to } 69.5 \text{ Westing} \\ 2, \text{ to } 28.8 \text{ Northing} \end{array} \right.$
	O 4	Courses

Courses.	Dist.	Diff. Lat.		Departure.	
		North.	South.	East.	West.
1. S. E. by S.	68		57.	38.	
2. S. W. by W.	55		30.6		46.
3. W. N. W.	75	28.8			69.5
			87.6		115.5
			28.8		38.
		Diff. Lat.	58.8		77.5 Departure

3. Then ; As 58.8m. is to 77.5m. so is T. 45 deg. to T. 52d. 50m. the Course from the South towards the West ; that is, S. W. $\frac{1}{2}$ W. almost. And again,

As S. 52 d. 50 m. is to min. 77.5 ; so is S. 90d. to 97 Minutes, the Distance from the first Place of Departure.

D. M.

Latitude departed from ——— 40 : 00 North.

The Diff. of Latitude min. 58.8 or 0 : 59 Southerly

Subtract, gives Latit. the Ship is in 39 : 01 North.

Therefore the Middle Latitude is 39 : 30

Subtracted from ——— 90 : 00

Makes Complement of Middle Latit. 50 : 30

4. As S. 50d. 30m. is to 77.5 ; so is S. 90d. to 100m. the Difference of Longitude. D. M.

The Longitude departed from is ——— 5 24 West.

The Difference of Longit. 100 Min. or 1 40 Westing.

Added, gives the Longit. the Ship is in 7 04 West.

Example 2. A Ship in 41d. 30m. North Latitude, and 10d. 20m. East Longitude, sails these several Courses, and Distances ; viz, S. E. by S. 52 Minutes, then S. S. W.

63 Min

63 Minutes, E. by N. 47 Minutes, N. by E. $\frac{1}{2}$ E. 35 Minutes, N. N. W. $\frac{1}{4}$ W. 47 Min. W. N. W. 73 Min. I determine the Course, and Distance from the first Place of Departure; also the Latitude, and Longitude *see* is in?

1. For the doing of which, observe the Work following.

	M.	Points.	M.
1	52	{ 3 }	{ 28.8 E
		{ 5 }	{ 43.2 S.
2	63	{ 2 }	{ 24.2 W
		{ 6 }	{ 58.2 S.
3	47	{ 1 }	{ 46.2 E.
		{ 7 }	{ 9.2 N.
4	35	{ 1 1/2 }	{ 10.2 E.
		{ 6 1/2 }	{ 33.6 N.
5	47	{ 2 1/2 }	{ 20. W
		{ 5 1/2 }	{ 42.5 N.
6	73	{ 6 }	{ 68. W
		{ 2 }	{ 28. N.

2. Then to collect the several Northings, Southings, Eastings, and Westings into one; as here you see in the Table following; whereby you will have the Difference of Latitude, and Departure from the Meridian.

Courses.	Diff.	Diff. Lat.		Departure.	
		North.	South.	East.	West.
1. S. E. by S	52		43.2	28.8	
2. S. S. W.	63		58.2		24.2
3. E. by N.	47	9.2		46.2	
4. N. by E. $\frac{1}{4}$ E.	35	33.6		10.2	
5. N. N. W. $\frac{1}{4}$ W.	47	42.5			20.
6. W. N. W.	73	28.			68.
		113.3	101.4	85.2	112.2
		101.4			85.2
Difference Latitude.		11.9	Departure.	27.0	

3. Now

3. Now having the Difference of Latitude, and Departure from the Meridian known, the Course and Distance is thus found :

As 11.9 Minutes is to 27 Minutes; so is T. 45d. to T. 66d. 15m. The Course from the North Westward, or W. N. W. nearest.

Here observe the Course is more than 45 Degrees from the Meridian, because the Departure is more than the Difference of Latitude; according to the Note in the 6th Case of Plain-Sailing, in Page 213. Then for the Distance say,

As S. 66d. 15m. is to 27 Minutes; so is S. 90d. to Minutes 29.4: The Distance from the First place of Departure.

D. M

Latitude departed from ——— 41 : 30 North.
The Difference of Latitude 11.9m or 0 : 12 Northerly,

Added, gives the Lat. the Ship is in 41 : 42 North.

And the Middle Latitude is ——— 41 : 36
Subtracted from ——— 90 : 00

Leaves Compl. of Middle Latitude—48 : 24

4. Then to find the Difference of Longitude, say:

As S. 48d. 24m. is to 27 Min. so is S. 90d. to 36 Min. the Difference of Longitude.

D. M.

The Longitude departed from is ——— 10 : 20 East
The Difference of Longitude 36 Min. or 0 : 36 West

Subtract, gives the Longit. the Ship is in—9 : 44 East

First,

First, The Use of Gunter's Scale in Navigation. Secondly, in Mercator's Sailing.

C A S E I.

The Latitude and Longitude of two Places given; to find their Course, and Distance.

Example. I demand the Course and Distance, from the Lizard to Barbadoes? their Latitudes, and Longitudes being supposed to be as follows :

	d. m.		d. m.
Lizard	50 00 North	Longit.	5 24 W.
Barbadoes	13.10 North		57.54 W.
The Diff. Latitude	36 50 South.	Diff. Long.	52.30 W.
	60		60

Minutes 2210

Minutes 3150

To Answer this Question, the Proportions are these :

1. As the Meridional Difference of Latitude ; is to the Difference of Longitude ; so is Radius, to the Tangent of the Course

2. As the Sine Complement of the Course, is to the Difference of Latitude ; so is Radius, to the Distance of the two Places.

The Meridional Difference of Latitude is thus found :

Extend the Compasses (in the Meridian-Line) from one Latitude to the other ; that Extent measured in the Equinoctial Line (the Line next adjoining to the Meridional-Line) gives the Meridional Difference of Latitude.

Thus the Extent from Latitude 50 Degrees to Latitude 13d. 10m. in the first, being measured on the latter, is 44 Deg. 35 Minutes, or 2675 Minutes, The Meridional Difference of Latitude. Then say :

As

As 2675 M. is to 3150 M. } So is T. 45d. T. 49d.
 Or, As 44d. 35m. is to 52d. 30m. }
 the Course from the South westward, or S. W. 4 Degrees Minutes Westerly. And again:

As S. 40d. 30m. is to 2250m. so is S. 90d. to 3400m.
 Or, As S. 40d. 30m. is to 36d. 50m. so is S. 90d. to 56d. 40m.

C A S E II.

Both Latitudes, and Courses given; to find the Distance, and Difference of Longitude.

The Proportions are these:

1. **A**S the Sine Complement of the Course, is to the Difference of Latitude, *&c.* as before in the Second Case of Plain Sailing, to find the Distance and Departure from the Meridian, in Page 210.
2. As the Sine Complement of the Middle Latitude is to the Departure from the Meridian; so is Radius, to the Difference of Longitude.

Or thus; As the Sine Complement of the Course, is to the Meridional Difference of Latitude; so is the Sine of the Course, to the Difference of Longitude.

Examp. Admit from the Lizard in 50d. 00m. North Latitude, and Longitude 5d. 24m. West Longitude, we make (when Lee-way, Variation allowed for) our Course to be South 39d. Westerly, and then by Observation is in 45d. 01m. North Latitude. I demand her Distance Run, and what Longitude she is in?

Latitude departed from ——— 50d 00m. North
 Latitude by Observation ——— 45d 01m. North
 Subtract, is the Diff. of Latitude — 4d 59m. Southerly

60

Minutes 299

The Middle Latitude is ——— 47d. 30m.
 Subtract from ——— 90d. 00m.
 Leaves Com. of the Middle Lat. — 42d. 30m.

1. As S. 51d. is to 299m. so is S. $\left\{ \begin{smallmatrix} 90 \\ 39 \end{smallmatrix} \right\}$ d. to $\left\{ \begin{smallmatrix} 385 \\ 242 \end{smallmatrix} \right\}$ Differ. Depar.

2. As S. 42d. 30m. is to 242 Minutes; so is S. 90d to 358 Minutes the Difference of Longitude. Or thus: The Extent from 50d. 00m. to 45d. 01m. in the Meridian Line, measured in the Equal Parts, is 7d. 25m. or 445 Minutes; for the Meridional Difference of Latitude: Then

As S. 51d is to 445 Minutes; So is S. 39d. to 358 Minutes. Or thus:

As 299 Minutes is to 242 Minutes, so is 445 Minutes to 358 Minutes as before, which is the Difference of Longitude. D. M.

The Longitude departed from ——— 5 : 24 West

The Difference of Longitude 358 Min. or 5 : 58 West

Added, gives the Longitude the Ship is in 11 : 22 West

C A S E III.

Both Latitudes, and Distance Run given; to find the Course and Difference of Longitude.

To perform this, the Proportions are these:

1. **A**S the Distance Run, is to Radius; so is the Difference of Latitude, to the Sine Complement of the Course; as in the Fourth Case of Plain Sailing, in Page 211, by which Case also you may find the Departure from the Meridian, or Meridional Distance,

2. As

2. As the Sine Complement of the Middle Latitude is to the Departure; so is Radius to the Difference of Longitude. Or thus:

As the Difference of Latitude is to the Departure from the Meridian, so is the Meridional Difference of Latitude to the Difference of Longitude.

Example. A Ship in 46d. South Latitude, and 1d. 15m. West Longitude, sails 100 Leagues North Eastward, and then by Observation is in Latitude 42d. South; I demand by Course, Departure from the Meridian, and Longitude she is in

Latitude departed from is 46d. South.

Latitude by Observation is 42d. South.

Subtract, gives the Diff. Lat. 4d. or 80 Leagues.

The Middle Latitude is — 44d. whose Compl. is 46 deg.

1. As 100 Leag. is to S 90 deg. so is 80 Leag. to S 53 deg. 15 min. the Complement of the Course; so that the Course is 36 deg. 45 min. North Eastward, or N. E. by N. $\frac{1}{2}$ E. And then again,

As S. 90d. is to 100 Leag. so is S. 36d. 45m. to 60 Leag. from the Meridian.

2. As S. 46d. is to 60 Leag. so is S. 90d. to 83 Leag. the Difference of Longitude. Or thus: The Extent from 46d. to 42d. on the Meridional Line, makes 5d. 30m. (or 110 Leagues on the Equal Parts) which is the Meridional Difference of Latitude. And then it's

As 80 Leag. is to 60 Leag. so is 10 leag. to 83 leag. $\frac{3}{4}$ diff. long.

Or, As 4d. is to 3d. 30m. so is 5d. 30m. to 4d. 9m. $\frac{3}{4}$

Longitude departed from is ——— 1d. 15m. West

The Difference of Longitude 83 Leag. or 4d. 09m. East

Subtract, gives Longitude Ship is in — 2d. 54m. East.

CASE IV.

Both Latitudes, and Departure from the Meridian given;
to find the Course, Distance Run, and Difference of Longitude

THE Course, and Distance Run, is found by the
Sixth Case of Plain Sailing, in Page 213

2. The difference of Longitude is found as in the last
Case, or any other Case in Mercator.

Example. A Ship in 33 Degrees North Latitude, and
78 Degrees West Longitude, she sails South Westward un-
til she be departed from the Meridian 58 Leagues, and then
she is in Latitude 28 d. 36 m. North; I demand her Course,
Distance Run, and what Longitude she is in?

d. m.

Latitude departed from ——— 33 . 00 North.

Latitude she is in ——— 28 . 36 North.

The difference of Latit. is ——— 4 . 24 or 88 Leagues.

The Middle Latitude is ——— 30 . 48 the Com 59-12

1. As 88 Leagues, is to 58 Leagues; so is T. 45d. to
33d. 20m. which is the Course South Westerly, or
W. by S.

2. As S. 33d. 20m. is to 58 Leagues; so is S. 90 d.
to 105 Leagues, the distance sailed.

3. The Meridional difference of Latitude is 5d. 10m.
103 Leagues, found as before directed.

As { S. 59d. 12m. } is to 58 Leag. { S. 90 deg. } to
{ 88 Leagues. } { 103 Leag. }

7 Leagues the difference of Longitude.

d. m.

5. Longitude departed from ——— 178 : 00 West

The difference of Longitude 67 Leag. or 3 : 21 West

Added, and the Sum is ——— 181 : 21

Which subtract from ——— 360 : 0

Remainder is Longitude the Ship is in — 178 : 39 East

CASE

C A S E V.

One Latitude, Course, and Distance Run given; to find the other Latitude, and Difference of Longitude.

1. **T**HE difference of Latitude, and Departure from the Meridian, is found by the first Case of Plain Sailing, (in Page 208, and 209) and consequently the other Latitude.

2. The difference of Longitude is found as before in the second or third Case of Mercator.

Example. If a Ship sails S. E. by S. 120 Leagues, from a Port in 53 d. 30m. North Latitude, and 2d 15m. West Longitude; What Latitude, and Longitude is she now in?

As S. 8 Points, is to 120 Leagues; so is S. 5. Points, to 100 Leagues, the difference of Latitude.

And, as S. 8 Points, is to 120 Leagues, so is S. 3 Points to 76 Leagues, the departure from the Meridian.

	d.	m.
2. Latitude departed from is	53	: 30 North
The diff. of Latitude 100 Leagues or	5	: 00 South
Subtract, gives Latitude she is in	48	: 30 North
And the middle Latitude is	51	: Comp. 39d.
3. The Meridional diff. Lat. is 8d. or	160	Leagues.
4. As { S. 39d. } is to 67 Leag	so is { S. 90 d. }	to
{ 100 Leag. }	{ 160 leag. }	
107 Leagues the difference of Longitude.		

	d.	m.
5. Longitude departed from is	2	: 15 West
The diff. Long. 107 Leagues, or	5	: 21 Easting
Subtract, gives Longitude she is in	3	: 06 East

C A S E

CASE VI.

Sailing in a Parallel; to find the Difference of Longitude.

To do this, the Proportion is thus:

AS the Sine Complement of the (Parallel or) Latitude, is to the distance sail'd (East or West,) so is Radius to the Difference of Longitude.

Example. If a Ship sails West 390 minutes, in the Latitude of 50 d. 10 m. and departs from 2 d. 45 m. East Longitude, I demand what Longitude the Ship is now in?

1. As S., 39d. 50 min. is to 390 min. so is S. 90d. to 610 min. the difference of Longitude.

	d.	m.
Longitude departed from is	2	45 East,
The Diff. Longitude 610 min. or	10	10 Westing.
Subtract, gives Longitude she is in.	7	25 West.

CASE VII.

The Difference of Longitude (of two Places in one Parallel or Latitude) given to find their Distance in that Parallel.

THE Proportion is thus: As Radius is to the difference of Longitude, so is the Sine Complement of the Latitude, to the distance in that Parallel.

Example 1. Sup/ose Cape Vincent in Portugal, and Cape Henry in Virginia, both in 37 d. North Latitude; their Longitudes suppose to be as here-under, What is their Distance in their Parallel?

	d.	m.
Cape St. Vincent } Longitude	10	35 West.
Cape Henry } Longitude	75	02 West.
Subtract gives Diff. Longit.	64	27 or 3867 Minutes
1 Latitude of both Places is		37 Deg. North.
Subtract from		90
Remains Complement of the Latitude		53 Degrees.

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2. As S. 90 Degrees, is to S. 53 Degrees; so is 6427m to 51d. 30 m. or 3090 min. the Distance Required. Or thus: As S. 90 Degrees, is to S. 53 Degrees; so is 3867 Minutes, to 3090 min. the Distance in the Parallel required.

Example 2. Suppose two Ships under the Equinoctial, and 100 Leagues asunder, and each sails North till both come into Latitude 60 deg. How far are they now asunder? Answer, 50 Leagues. For it's thus:

As S. 90 deg is to S. 30 deg. so is 100 Leagues to 50 Leagues, the distance required.

C A S E VIII.

To find how many Minutes or Miles make a Degree of Longitude, in any Parallel or Latitude.

The Rule.

AS Radius, is to the Sine Complement of the Latitude so is 60 min. (a degree in the Equinoctial,) to the Minutes making a degree of Longitude required.

Example. In the Latitude of 50 deg. I demand how many Minutes (of Easting or Westing) make a degree of Longitude? Answer, 38½ Minutes. For it's thus:

As S. 90. deg. is to S. 40 deg so is 60 min. to min. 38. or 38 and a half, to make one degree of Longitude in Latitude 50 degrees.

This may be done by the Plain Scale thus:

Take the given Latitude from the Chords, and measured on the Line M. L. (which is Miles of Longitude sheweth your desire: So here take 50 deg. from the Chords, and measure it on the Scale M. L. it sheweth 38 min. and a half as before.

VI, T

VI. The Use of Gunter's Scale in Astronomy.

PROBLEM I. The Sun's Place in the Ecliptick, and his greatest Declination given; to find his Right Ascension, and present Declination.

To perform this, these are the Proportions:

As Radius, is to the Sine Complement of the Sun's greatest Declination; so is the Tangent of his Longitude (from the nearest Equinoctial Point,) to the Tangent of his Right Ascension, from the said Point.

The Names and Characters of the 12 Signs.

♈ Aries.	♎ Libra.	} South Signs
♉ Taurus.	♏ Scorpio.	
♊ Gemini.	♐ Sagittarius.	
♋ Cancer.	♑ Capricornus.	
♌ Leo.	♒ Aquarius.	
♍ Virgo.	♓ Pisces.	

North Signs.

South Signs

Note 1. The Sun's greatest Declination is 23 degrees 30 minutes.

Note 2. The beginning of ♈ and ♎ are the two Equinoctial Points.

Note 3. This Proportion (above) finds the Sun's Right Ascension only when he is in the first Quarter of the Ecliptick; that is, ♈, ♉, or ♊: But when he is in the second Quarter, ♋, ♌, or ♍, subtract it from 180 deg. and when in ♎, ♏, or ♐, add it to 180 degrees: And in the last Quarter, ♑, ♒, or ♓, subtract (what's found by this Operation) from 360 deg so will you have the Sun's Right Ascension from ♈ (for any Place in the Ecliptick) desired.

2. As Radius, is to the Sine of the Sun's Longitude from the nearest Equinoctial Point;) so is the Sine of his greatest Declination, to the Sine of his present Declination.

Note, The Sun being in γ , δ , π , ϕ , ϵ , or $\pi\chi$, his Declination is North: But in ϵ , μ , λ , $\nu\delta$, ω , or χ it's South.

Example.

When the Sun's Place in the *Ecliptick* is δ 24 degrees 15 minutes; What is his Right Ascension, and Declination?

The Sun being in δ 24 degrees 15 minutes, his Longitude from the nearest Equinoctial Point (being now the beginning of γ) is 54 degrees 15 minutes. And the Complement of his greatest Declination always is 66 degrees 30 minutes. Then it follows:

1. As S. 90 degrees, is to S. 66 degrees 30 minutes; so is T. 54 degrees 15 minutes, to T. 51 degrees 50 minutes, the Sun's Right Ascension (from the beginning of γ) required.

1. *By Gunter with Compasses:*

The Extent from 90 degrees, to 66 degrees 30 min. in the Line of Sines; will reach in the Line of Tangents from 54 degrees 15 minutes, to 51 degrees 50 minutes the Right Ascension.

2. *By a Sliding Gunter.*

1. Let the middle Piece be so put in, that Sines may slide against Sines, and Tangents against Tangents.

2. Then bring 90 degrees in Sines (on the outside Piece) against 66 deg. 30 min. in Sines (on the middle Piece) then against 54 deg. 15 min. in Tangents (on the middle Piece) is 51 deg. 50 min. in Tangents (on the outside Piece) the Right Ascension as above.

This Proportion being to be wrought on Sines, and Tangents jointly, I thought it necessary to express the manner of its Operation on both sorts of Gunters, that the Learner might see how it agrees with the General Rule given at the beginning of this Discourse of the *Gunter*, in Page 177, and 178; but shall wave it in the rest, and only write the Proportions in Words, and in Figures, according to the particular Example; as here follows for the Sun's Declination in the foregoing Example.

2. As

2. As $S. 90$ degrees, is to $S. 54$ deg. 15 min. so is $S. 23$ deg. 30 min. to $S. 18$ deg. 52 min. the Sun's Declination North, increasing.

PROBLEM II.

The Latitude of a Place, and the Sun's Declination given ; to find his Amplitude, and his Ascensional Difference ; and consequently his Rising, or Setting ; and the Length of the Day or Night.

To perform this Problem, the Proportions are these :

1. **A**S the Sine Complement of the Latitude, is to Radius ; so is the Sine of the Sun's Declination, to the Sine of his Amplitude.

Note, The Amplitude and Declination are always of one kind ; that is, both North, or both South.

2. As Radius, is to the Tangent of the Latitude ; so is the Tangent of the Sun's Declination, to the Sine of his Ascensional Difference.

Note, 1. The Ascensional Difference (being reduced into Time, by allowing 15 deg. for one Hour, and then) added to, and subtracted from 6 Hours, the one is Sun-rising, the other is Setting

Note, 2. If Latitude and Declination are both North, or both South ; the Sun riseth before, and sets after 6 of the Clock ; but if one be North, and the other South, the contrary.

Note 3. If the Sun's rising, and setting be doubled severally, the first is the length of the Night, and the latter the length of the Day.

Note 4. By this Problem were the Tables of Amplitudes, and Semidiurnal Arches, &c. in this Book calculated.

Example. Latitude 51 deg. 32 min. North, and the Sun's Declination 23 deg. 30 min. North ; I demand his Amplitude, and Ascensional Difference ? Also his Rising, Setting ; Length of the Day and Night.

d. m. d. m.

Answ. His Amplitude 39 . 50, Ascens. Diff. 33 . 10

Sun-setting hour --- 8 . 13, Length of Day 16 . 26

Sun-rising (hour --- 3 . 47, Length Night 7 . 34

For it's thus;

1. As S. 38. deg. 28 min. is to S 90 deg. so is T. 23 d. 30 min. to S. 39 deg. 50 min. the Amplitude North, because the Declination is North.

2. As T. 45 deg. is to T. 51 d. 32 min. so is S. 23 deg. 30 m. to T. 28 deg. 40 m. against which, in Sines is 33 deg. 10 min. the Ascensional Difference; which being reduced into Time, is 2 hours 13 minutes; and added to 6 hours, is 8 hours 13 min. for Sun setting; which doubled, is 16 hours 26 minutes, the length of the Day.

Again, 2 hours 13 minutes subtracted from 6 hours, is 3 hours 47 minutes Sun-rising; which doubled, is 7 hours 34 minutes, length of the Night.

P R O B L E M III.

Latitude of a Place, and the Sun's Declination given; to find his Altitude, and Azimuth at 6 of the Clock.

To solve this Problem, say:

1. **A**s Radius, is to the Sine of the Latitude; so is the Sine of the Sun's Declination, to the Sine of his Altitude at 6 of the Clock.

2. As Radius, is to the Sine of the Complement of the Latitude. So is the Tangent of the Sun's Declination, to the Tangent of his Azimuth (from the East, or West) at 6 of the Clock.

Note, The Azimuth is from the East, at 6 in the Morning; and from the West, at 6 in the Afternoon: Northerly, in North Latitude; but Southerly, in South Latitude.

Example In 51 d. 32 m. North Latitude, the Sun's Declination being 23 d. 30 m. North; What is his Altitude, and Azimuth at 6 of the Clock?

Answ.

Ans. His Altitude is 18 d. 12 m. and his Azimuth is 15 d. 10 m. Northerly, or 74 d 50 m. North Easterly, or Westerly. For it's thus:

1. As S 90 d. is to S 51 d. 32 m; so is S. 23 d. 30 m. to S. 18 d. 12 m. the Altitude at 6 of the Clock.

2. As S. 90 d. is to S. 38 d. 28 m so is T. 23 d. 30 m. to T. 15 d 10 m. the Azimuth at 6; that is 74 d. 50 m. North Easterly in the Morning; but North Westerly, in the Evening.

P R O B L E M I V.

Latitude of a Place, and the Sun's Declination given; to find his Altitude, and Hour of the Day when he is East, or West.

To perform this, the Proportions are these:

1. **A**S the Sine of the Latitude, is to Radius; so is the Sine of the Sun's Declination, to the Sine of his Altitude; being East, or West.

2. As Radius, is to the Tangent Complement of the Latitude; so is the Tangent of the Sun's Declination, to the Sine of the Hour from 6 of the Clock, when he is East, or West.

Note 1. The Sun is East after 6 in the Morning, but West before 6 in the Evening.

Note 2. The Hour found by the last Proportion being reduced into Time (by allowing 15 deg. to an Hour) and added to, or subtracted from 6, giveth the Hour of the Day required.

Example. In 51 d. 32 m. North Latitude, the Sun's Declination being 23 d. 30 m. North; What is his Altitude? and what time of the Day is it, when he is East, or West?

Ans. His Altitude is 30 d. 35 m. and the Hour of the Day is $\begin{cases} 7 \text{ h. } 21 \text{ m. Morning, when East.} \\ 4 \text{ h. } 30 \text{ m. Evening, when West.} \end{cases}$

For it's thus;

1. As S. 51 d. 32 m. is to S. 90 d; so is S. 23 d. 30 m. to S. 30 d. 35 m. the Sun's Altitude, being either East, or West.

2. As T. 45 d. is to T. 38 d. 28 m. ; so is T. 23 d. 30 m. to S. 20 d. 15 m. The Hour from 6, which is 1 Hour 21 Minutes, added to 6, is 7 h. 21 m. and subtracted from 6, is 4 h. 39 m. the former is the Time when the Sun is East in the Morning ; the latter the Time in the Evening when he is West.

P R O B L E M V.

The Sun in the Equator or Equinoctial, (that is, when he hath no Declination) the Latitude of a Place, and Sun's Altitude given ; to find his Azimuth, and Hour of the Day.

This Problem is thus effected.

1. **A**S Radius, is to the Tangent of the Latitude, so is the Tangent of the Sun's Altitude, to the Sine of the Complement of his Azimuth ; from the South, in North Latitude ; but from the North in South Latitude ; Easterly in the Forenoon ; and Westerly Afternoon.

2. As the Sine of the Complement of the Latitude, is to Radius, so is the Sine of the Sun's Altitude, to the Sine of the Complement of the Hour from Noon.

Example. In 51 deg. 32 min. North Latitude, the Sun having no Declination, and his Altitude being 21 deg. 50. min. in the Forenoon ; I demand his Azimuth, and the Hour of the Day ?

Ans. His Azimuth is 59 d. 45 m. South Easterly ; and the Hour of the Day is Hour 8.33 minutes Morning. For it's thus:

1. As T. 45 d. is to T. 51 d. 32 m. ; so is T. 21 d. 50 m. to S. 30 deg. 15 min. whose Complement, is 59 d. 45 m. the Sun's Azimuth required.

2. As S. 38 deg. 28 min. is to S. 90 deg. so is S. 21 deg. 50 min. to S. 35 deg. 50 min. whose Complement is 54 deg. 10 min. or 3 Hours 33 Minutes ; which subtracted

tracted from 12, gives 8 Hours 27 Minutes, or 27 min. after 8 of the Clock in the Forenoon, the Time of the Day required.

P R O B L E M VI.

Latitude of a Place, Sun's Declination, and his Altitude given; to find his Azimuth, and the Hour of the Day.

The Performance of this, is thus:

1. **T**AKE the Complement of the Latitude, the Complement of the Sun's Altitude, and the Sun's distance from the Pole, (which is his Declination added to 90 deg. when the Latitude and Declination is one North, the other South; but both being either North, or South, it's the Complement of the Declination) and add them together into one Sum.

2. From half that Sum; subtract (to find the Azimuth) the Sun's distance from the Pole; but (to find the Hour) the Complement of his Altitude; and note the Remainder.

3. *To find the Azimuth, you have these two Proportions following.*

First, As Radius, is to the Sine of the Complement of the Latitude; so is the Sine of the Complement of the Altitude, to a fourth Sine. Then again,

Secondly, As that fourth Sine, is to the Sine of the half Sum; so is the Sine of the Remainder, to a fifth Sine; against which, in Verted Sines, is the Sun's Azimuth from the North in North Latitude; but from the South in South Latitude.

4. *To find the Hour, these are the two Proportions which follow.*

First, As Radius, is to the Sine of the Complement of the Latitude; so is the Sine of the Sun's distance from the Pole, to a fourth Sine.

Second

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Secondly, As that fourth Sine is to the Sine of the half Sum; so is the Sine of the Remainder to a fifth Sine; against which, in Versed Sines, is the Hour of the day from Noon.

Example. In 52 deg. 30 min. North Latitude, the Sun's Declination being 15 deg. 10 min. North, and his Altitude observed to be 11 deg. 30 min. I demand his Azimuth, and Hour of the Day?

	90 d.		90 d.		90 d.
Latitude---	51.30	North.	Declinat. 15.10	Nor.	Alt 11.30
Comp. Lat.	38.30	Sun's dif. fro.	Pole 74.50	Com.	Alt. 78.30
Comp. Alr.	78.30	Comp. Latitude	38.30		
Sun's Dist	74.50	Com. Altitude	78.30		
Sum is ---	191.50	Sum is ---	191.50		
half Sum is	95.55	The half Sum is	95.55		
Remaind.	21.05	Remainder is---	17.25		

Then to find the Azimuth, it's thus:

1. As Sine 90 d. is to Sine 38 d. 30 m; so is Sine 78 d. 30 m. to Sine 57 d. 20 m. the fourth Sine.

2. As Sine 37 d. 20 m. is to Sine 95 d. 55 m. so is Sine 21 d. 05 m. to Sine 36 d. against which, in Versed Sines, is 80 d. the Sun's Azimuth from the North, Easterly, if in the Forenoon; but Westerly, in the Evening.

And to find the Hour of the Day, it's thus:

1. As Sine 90 d. is to Sine 38 d. 30 m. so is Sine 74 d. 30 m. to Sine 57 d. the fourth Sine.

2. As Sine 37 d. is to Sine 95 d. 55 m so is Sine 17 d. 25 m. to Sine 29 d. 40 m. against which, in Versed Sines, is 90 d. 30 m. or 6 Hours 2 Minutes which is the Hour from Noon, that is, 58 Minutes after 5 of the Clock in the Morning; or 2 Minutes after 6 in the Afternoon.

The Description and Use of the

SECTOR.

1. **T**HIS useful Instrument may be of any Length, but is commonly made one Foot, 18 Inches, or 2 Feet long, to open in a Joint in the middle, like a Carpenter's Rule; one Inch and a half (or more) in breadth, and of any thickness at pleasure, according to the matter it's made of; which may be either *Boxwood, Ivory, Brass, or Silver.*

2. There are two sorts of *Sectors*, known by the Names of *Gunter's*, and *Foster's Sector*; and are sometimes both put on one Instrument; that is, *Gunter's Sector* on one side of it, and *Foster's* on the other.

3. The Lines of *Gunter's Sector*, are these, *Line of Lines*, (marked at the end with *L*.) *Line of Sines* (marked *S*.) *Superficies* (marked *Sup.*) *Solids* (marked *Sol.*) *Line of Metals*, *Line of Equated Bodies*, *Line of Inscribed Bodies*, &c.

4. The Lines of *Foster's Sector*, are these Five, *viz.* *Line of Lines*, or *Equal Parts*, *Chords*, *Sines*, *Tangents*, and *Secants*; each marked at the end with it's Name, or first Letter of its Name.

5. All *Sector Lines* or *Scales*, meet at the Center of the Head (where the Joint is) at the Left hand, and from thence are figured towards the Right, each being twice repeated: that is, one on each Leg or Side of the *Sector*, answering one another.

6. The *Sector* is useful in Projection, to reduce, or to make a Scheme to any (possible) Magnitude: also in proportion, to work any stated Canon or Analogy in *Arithmetick*, *Geometry*, *Trigonometry*, *Navigation*, *Astronomy*, &c. of which I will give a brief Touch, yet so as the Learner may be informed how to apply it further.

1. The Use of the Sector Lines for Projection.

IN Projections it's often requir'd to enlarge, or diminish the Scale, that the Draught designed may be of it's desir'd Magnitude; in doing of which are used Lateral, and Parallel Distances, or Extents of the Compasses. And to avoid a needless saying over the same things, take once for all what's meant by a *Lateral*, and a *Parallel Distance*, or *Extent of the Compasses*.

1. A *Lateral Distance* (in any Line or Scale) is the Extent or Distance (taken along the length of the Line, or Scale) from the beginning thereof to any Number (therein) desired.

As for Example: The *Lateral Sine* of 30 degrees is the Distance of 30 from the beginning of the *Line of Sines*; and so is it in the *Line of Equal Parts*, *Chords*, *Tangents*, *Secants*, &c.

2. A *Parallel Distance* (in any Line, or Scale on the Sector) is the Extent or Distance, taken across from any Number in any Line on one Leg of the Sector, to the like Number in the like Line on the other Leg of the Sector.

Or, the nearest Distance from any Number on one Leg (taken across) to the like Line on the other Leg of the Sector.

As for Example: The *Parallel Sine* of 30 Degrees is (supposing the Sector open'd to any Angle) the Distance from 30 in the *Line of Sines* on one Leg of the Sector to 30 in the *Line of Sines* in the other Leg.

Or, the nearest Distance from 30 in the *Line of Sines* on one Leg, to the *Line of Sines* (that is to say, the Line issuing from the Center of the Joint or Head) on the other Leg, is the *Parallel Sine* of 30 deg. In like manner is it done in any other Line or Scale.

This being understood, the enlarging, or diminishing of any of the Lines; or the finding a Chord, Sine, Tangent, or Secant; to any proposed Radius, will not be difficult;

difficult; yet for the Learner's further Satisfaction, take a General Rule.

To find a Chord, Sine, Tangent, or Secant, &c. to any Radius (greater or lesser) proposed.

The general Rule is thus:

1. Take the proposed Radius in the Compasses, and make it a Parallel on the Sector in the Radius of any one Line: that is, open the Sector till the proposed Radius (in the Compasses) be a Parallel Chord of 60 degrees in the Line of Chords; or a Parallel Sine of 90 degrees in the Line of Sines; or a Parallel Tangent of 45 degrees in the Line of Tangents; or a Parallel-Secant of 0 degrees in the Line of Secants; for the Chord of 60, Sine of 90, Tangent of 45, and Secant of 0 degrees are equal, and each equal to Radius.

2. The Sector being kept at that open'd Distance or Angle, any Parallel-Distance in any Line, will be a Lateral Distance on a like Line to the proposed Radius: that is; a Parallel Chord of 10, 20, 30, &c. is the Chord of 10, 20, 30, &c. to the proposed Radius; also, a Parallel-Sine, Tangent and Secant of 20, 30, 40, &c. is the Sine, Tangent, and Secant, of 20, 30, 40, &c. to the foresaid Radius.

2. The Use of the Sector in working Proportions.

SUPposing the Learner understands how to take a Lateral Distance on the Line of Lines (otherwise called Equal Parts) on the Chords, Sines, &c. And to apply them Parallel in any Line on the Sector; the working of any Proportion is thus:

A General Rule to work by the Sector.

1. Take the second Term Lateral (that is, from the beginning of the Line to the proposed second Term) and opening the Sector, apply that Extent Parallel (that is,

is, across it) in the first Term; there stay the *Sector* at that Parallel Extent.

2. Then the Parallel-Distance, taken in the third Term, and measured Laterally gives the fourth Term sought for or required.

Or briefer thus: As the Lateral second Term is to the Parallel first Term; so is the Parallel third Term, to the Lateral fourth Term.

This one Rule is sufficient for any Proportion whatever, and will appear so by a few Examples.

P R O B. I. *To Multiply by the Line of Lines on a Sector.*

The Proportion is:

A S 1, is to the Multiplicand; so is the Multiplier, to the Product.

Example. *What's the Product of 8 multiplied by 4?*

The Analogy, or Proportion, is this;

As 1, is to 8; so is 4 to the Product 32: thus found by the *Sector*, and General Rule aforesaid

1. In the Line of Lines (that is the Line of Equal Parts) take the second Term 8 Lateral; that is, from the Center of the Joint, and the beginning of the Line, to 8 in the same Line.

2. Open the *Sector* till you fit the (foresaid Lateral) Distance in the Compasses a Parallel in 1 and 1, or 10 and 10: that is; set it over from 10 to 10 at the end of the same Line, and now counted for 1 and 1, the first Term; keep the *Sector* just at that Angle or opening.

3. The Parallel Distance of the third Term 4: that is, from 4 to 4 taken across from one Leg to the other, in the said Line of Lines, and measured Lateral (which is from the beginning of the Line, towards the end, and) it's 32, the fourth Term, or Product of 8 Multiplied by 4. Or shorter thus:

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As the second Term 8 (Lateral taken) is to the first Term 10 (Parallel set,) so is the third Term (Parallel taken in) 4, to the fourth Term (Laterally measured, is) 32, the Product as before. Or thus: As the Lateral 4, is to the Parallel 10, counted for 1; so is the Parallel 8, to 32, as before.

PROBLEM II.

To divide by the Line of Lines on a Sector.

The Analogy or Proportion is thus:

AS the Divisor, is to 1; so is the Dividend to the Quotient. Or thus:

As the Divisor, to the Dividend; so is 1, to the Quotient.

Example. How many Square Yards, are in 36 Square Feet? Answer, 4 Square Yards. For it's thus:

As 9, is to 1; so is 36, to the Quotient 4; thus to be wrought by the Sector: As Lateral 1, is to Parallel 9, so is Parallel 36, to Lateral 4. the Yards required.

PROBLEM III.

To work the Rule of Three by the Line of Lines on a Sector: or into Three Numbers given, to find a fourth in Geometrical Proportion.

The Analogy is:

AS the first Term, is to the second Term; so is the third Term to the fourth Term required.

Example 1. If the Diameter of a Circle be 14 Inches; What's the Circumference? Answer, 44 Inches. For the Proportion is thus:

As 7, is to 22, so is the Diameter 14, to 44. the Circumference required; by Sector thus wrought: As Lateral

teral 22, is to Parallel 7; so is Parallel 14, to Lateral 44, the Circumference of a Circle whose Diameter is 14.

Example 2. If a Plank or Board be 15 Inches broad, and 20 Feet long; How many Feet is in it? Answer, 25 Feet; for the Proportion is this:

As 12 is to 15 the breadth, so is 20 the length, to 25 Feet, the Content of the Board. And by Sector thus to be wrought. As Lateral 15, to Parallel 12; so is Parallel 20, to Lateral 25 Feet, the Content of the Plank.

Example 3. A Ship being in 42 degrees 20 Minutes North Latitude, she sails N. E. by N. 104 Leagues; I demand the Latitude she is in, and her Departure from the Meridian?

The Canons or Proportions are these;

1. As Radius, to the Distance sail'd, so is the Sine of the Course, to the Departure from the Meridian. That is, by the Sector thus: As Lateral 104 Leagues (from the Line of Lines) is to Parallel Sine of 90 degrees, so is Parallel Sine of 42 degrees 45 Minutes (the Degrees of the Course from the Meridian) to Lateral 58 Leagues (on the Line of Lines) the Departure from the Meridian.

Note. If 104 Leagues, taken Lateral, be troublesome, to fit Parallel in Sine of 90 degrees; then take it's half, or quarter Lateral; and the Answer will be accordingly its half or quarter: As here, if you take 52, the half of 104 Leagues; the Answer would be 29, whose double is 58 for the Departure from the Meridian, as before.

2. As Radius is to the Distance sail'd; so is the Sine Complement of the Course, to the Difference of Latitude.

By the Sector thus:

As Lateral 104 Leagues, is to Parallel Sine of 90 deg. so is Parallel Sine of 56 deg. 15 Minutes, to Lateral 87 Leagues, the Difference of Latitude; by which you may find the Latitude the Ship is in, as before in the Use of the Gunter, in Page 202, and 203.

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Example. 4. *A Ship sails South Easterly, till her Difference of Latitude be 275 Minutes, and the Departure from the Meridian be 412 Minutes; I demand her Course, and Distance sailed?*

The Canons are these;

1. *As the Difference of Latitude, is to the Departure; so is Radius, to the Tangent of the Course. That is,*

By the Sector thus:

As Lateral 412 Minutes is to Parallel 275 Minutes, so is Parallel Tangent of 45d. (that being Radius now) to Lateral Tangent of 56d. 15m. the Course from the Meridian, which makes S. E. by E.

2. *As the Sine of the Course, is to the Departure; so is Radius, to the Distance sailed.*

By the Sector thus:

As Lateral 412 min. is to Parallel Sine 56 deg. 15 min. so is Parallel Sine of 90 deg. (that now being Radius,) to Lateral 495 min. the Distance sailed.

After this manner may any Proportion be wrought by the Sector, which I leave for the Learner's Exercise.

The Use of the following TABLES of Latitude and Longitude.

L *atitude and Longitude are two primary Affections of the Earth: By the help of these two doth the Geographer strive to represent the Parts of the Earth, that they may keep symmetry and harmony with the whole.*

Latitude is an Arch of the Meridian, comprehended between the Equinoctial and a Parallel. But Longitude is an Arch of the Equinoctial, intercepted between the Meridian of London, and the Meridian of any other Place.

For the exact settling of Latitude, we have many absolute helps; but the Longitude of a Meridian, is that

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which

which hath, and still wearieth the greatest Master of Geography.

I have endeavoured to settle the Longitude with much exactness as possible I could: For I not only calculated according to the Latitude and Meridian Distance of each Place from the Meridian of London; which Meridian Distance I obtained from the exactest Geographical Charts extant; but I consulted with the Reckoning skilful Mariners; and when I found any difference composed it both according to Art and Reason.

As for instance; I had from able Mariners, upon their long Experience, the Meridian-Distance from Barbadoes to the Lizard: According to which I have settled the Longitude of all the eminent Places in the West-Indies.

And for the settling of the Longitude of Places East-India, I consulted Observations of Eclipses, both Antient and Modern; as in 161 Page of *Harmonicon Celeste*, the difference of Meridians between Goa and London, is 5h. 48m. and Malacca and London is 6 h. 49m. My Table hath the former of these 5h. 58m. and the latter 6 h. 45m. the difference between my Table and the former of these Observations is 10m. and of the latter is 4 m. which Difference may be born withal.

" If the Reader considers the time, being 1664, with the Great Labour and Pains, to my knowledge, bestowed then his Servant, the Author bestowed, and expended in performing this Work, they were then the best of this kind.

" But since that Time there hath been better Helps, new Discoveries made, and new Places found out; the Compiler at the Request of the Bookseller, and out of respect to the deceased Author, but most of all for the Publick Good, hath made such Amendments herein as was possible, by comparing of the best Observations, Tables, Charts, Maps, and Sea-Journals, he was able to procure; so that it may be concluded, these Tables are

the Truest, or come (in the general) nearest the Truth of any extent in our Language; not that they are so exact in every particular Place, as to need no Amendment in time, but with respect to the present Helps in 1707, they are so.

“ And now I could wish that either *Authority* would order, or that all concerned in setting forth *Latitude* and *Longitude*, *Tables*, *Charts*, and *Maps*; would mutually unite in; Fixed-Meridian to begin *Longitude* at.

“ For, altho’ *Longitude* may begin at any Meridian yet the convenience of its beginning at one *Meridian*, in all our *English Navigation-Books*, and *Charts*, would render the Study and Practice of *Navigation* much more pleasant and easie, than now it is: Such various beginnings and countings of *Longitude*, occasioneth some to *Stumble*, some to *Mistake*, and some to *Condemn* all to be false; but not considering the several *Meridians* made use of, which such a wished *Union* would prevent.

“ But this is not likely in my time, who am so near the *Grave*; yet should it be set on foot, while I am on this side the other World, my best performances should not be wanting to promote it, and should count all my spare Hours from necessary preparation for my *Last-End*, well spent in such a *Useful* and *Publick Good*.

Note 1. I do begin the *Longitude* (in my *Tables*) at the Meridian of *London*, and encreasing it on both sides the said Meridian; that is to say, both Eastward and Westward, and terminate at 180 Degrees.

2. Therefore (according to this account) all Places on the East-side of the Meridian of *London*, lie in East-Longitude: and on the contrary, all on the West-side of it lie in West-Longitude.

3. If a Ship be in East-Longitude, sailing to the Eastward,

ward, the Longitude increaseth; but sailing to the Westward, the Longitude decreaseth.

4. And on the contrary, if a Ship be in West-Longitude, then sailing to the Westward, the Longitude increaseth, and sailing to the Eastward, it decreaseth.

5. Take notice that at Places in East-Longitude, the Sun cometh on their Meridian before he cometh on the Meridian of *London*. As thus; if a Place lie in 15 deg. East-Longitude, the Sun cometh one Hour sooner to the Meridian there, than he doth to the Meridian of *London*. If in 30 deg. East-Longitude, then two Hours sooner; if 45 deg. three Hours sooner, if 60 deg. four Hours sooner; if 75 deg. five Hours sooner, if 90 deg. six Hours sooner; if 105 deg. seven Hours sooner; and so you may reckon for any other Longitude. But on the contrary All those Places that lie in West-Longitude, the Sun, or Star cometh on their Meridian after he is past the Meridian of *London*.

To find the Difference of Longitude between any two Places.

IF both Places be in East-Longitude, or both in West-Longitude, subtract the lesser Longitude out of the greater, and the Remainder is the Difference of Longitude.

If one Place be in East-Longitude, and the other in West-Longitude, add both together, and their Sum is the Difference of Longitude.



A TABLE containing the Chief Harbours, Headlands and Islands in the World; shewing their Latitude and Longitude: Beginning the said Longitude at the Meridian of London.

The Sea-Coast of Greenland.

Names of Places.	Latitude		Longitude	
	D.	M.	D.	M.
H Aclairs Headland	79	50	12	10
Fair Foreland	79	15	11	05
Cape Cold the North end of }	79	00	10	32
Charles Isle }				
Black Point, South end of it	78	30	12	40
Dear Sound	79	15	13	00
Foul Sound	77	38	13	20
Bell Sound	77	34	13	59
Horn Sound	77	17	14	30
Point Lookout	76	35	16	10
Helies Sound	79	17	12	20
Cape Barcam	78	25	23	32
Cape Blanco	78	00	23	30
Bucks Cove }	77	45	23	10
Negro Point } Edges Island	77	10	23	30
Hope Island	76	25	26	12
Cherry Island or Boar Island	74	40	18	18
Ice Point or Cape Desire	77	40	69	10
Admiralties Island	75	10	60	00
Langeness	74	35	58	00
Cross Point	72	25	56	12
Fretum Burrough	70	00	66	20
Mauritius Isle	69	35	57	00
Cape Candemose	69	25	41	15
Cape Barso	66	00	38	25

Sea-Coasts from Archangel to the Naze of Norway.

Names of Places.	Latitude.		Longit.	
	D.	M.	D.	M.
Archangel	64	25	34	58
Cape Grace, or Cape Bona Fortuna	65	37	37	30
Cape Gallant, or Sweetno'e	67	41	36	00
Kildugn Island	69	10	32	00
River Kola	69	15	31	50
Scuttinberg Nefs	71	10	24	38
North Cape	71	25	22	42
Landen	71	08	18	08
Island Sanien	62	30	13	15
Werro, or Weroy	67	00	07	28
Dronien	64	01	08	06
Ransdel	63	20	06	52
North Point	62	30	03	46
Katts Nefs, or Scutts Nefs	61	54	03	22
South Point				
Harla Island, the South end	60	14	03	38
Bergen	60	10	04	20
Bommel Sound	59	30	03	40
Out Seers	58	45	03	16
Tedder	58	27	04	40
Naze of Norway	58	00	06	02

East Longitude.

Sea-Coasts in the Sound.

	Names of Places.	Latitude		Longitude	
		D.	M.	D.	M.
	Maerden	58	17	07	58
	Long Sound	58	37	08	00
	Maerwick	58	40	08	44
	Maerwick	59	10	08	50
	Maesloot or Christian	59	10	09	10
58	Gustenberg Gat	57	36	12	18
30	Cape Kol	56	10	12	42
00	Ellensburg	56	16	12	50
00	Kalsterbore	55	22	13	05
50	Christianopoli	58	30	14	35
38	Calmor	56	45	14	54
42	Oeland the	South-end		56	20
08		North-end		57	20
15	Stockholm	57	33	14	35
28	Stockholm	59	00	17	02
06	Aboe	60	38	19	59
52	Raskeburgh	60	40	21	28
46	Borgo	60	52	26	10
22	Pelting Sound	60	30	27	10
38	Wekelax	60	46	28	18
20	Wyburgh	61	00	29	26
40	Cast Rand, or Castrum	60	02	29	47
16	Narva	59	35	28	50
40	Revel	59	28	25	18
02	Nargin Island	59	50	24	35
	Sybrichness of Dageroort	59	34	23	11
	Arensburg in Oesel Island	58	45	23	42
	Parnout	58	22	27	30
	Rumen Island	58	00	24	00
	Ryga	57	10	24	50
	Domangsa	58	00	23	00

North Latitude.

East Longitude.

The Mariners Compass Rectified.
Sea Coasts in the Sound.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Der-Winda				
Der-Memel	57	08	22	43
Gonnesberg	56	15	21	20
Danzick	55	5	20	32
Heel	54	30	19	05
Gotland, the North-end	55	00	18	35
Faro Sound	58	00	19	09
Gotland Wisbuy				
Gotland, the South-end	57	28	19	00
Born Holm	57	00	18	00
Camin or Hamn	55	28	15	06
Fasmond on Rugen	54	25	15	06
Stetin	55	00	13	40
Straelfond	54	15	15	40
Wasmor	54	30	12	50
Lubeck	54	15	12	00
Copenhagen	54	10	10	06
Elfenore	55	40	12	24
Anour Island	56	15	12	17
Leson or Lesnow Island	56	45	10	54
The Seaw	57	05	10	19
	57	26	10	00

The Sea Coasts of Holland and Flanders, from the
Seaw to Calis.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Holy Land, or Heligland Isle	54	30	08	00
Hambrough	54	00	10	00
Bremen	53	50	09	12
Emden	53	34	08	00
Amerland	53	40	06	40
Schelling	53	25	05	30
The Fly	53	15	05	28

The Sea Coasts of Holland and Flanders, from the Schaw to Calais.

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
The Texel	53	10	05	12
Amsterdam	52	30	05	00
Rotterdam	51	55	04	20
Antwerp	51	17	04	32
The Brill	52	00	04	14
Middleburgh in Zealand	51	48	04	00
Sluys	51	28	03	57
Ostend	51	30	03	05
Dunkirk	51	18	02	25
Calis	51	00	01	52

North Latitude.

East Longitude.

The Sea Coasts about the Island of Iseland.

Grimes Hole or Geubermans Rocks	66	23	20	50
Gamatt Isles or Gille	65	48	27	30
Westmania Isles	63	37	23	17
Rook Point	64	00	26	03
Snow Hill	65	11	27	14
Fair Foreland	65	40	26	17
Rage Point or Orgel Bay	66	30	25	14
Marza or Langerness	66	08	24	00
Grimsa Isle	67	22	22	44
Lange Ness	66	56	13	00
Bargafer Point or Helles	66	07	12	35
Silly, or Papay Isle	64	50	12	10
Horn Bay	64	42	12	10
Merchants Foreland	63	52	19	06
Portland	64	02	21	05

North Latitude.

West Longitude.

The Sea Coasts of Scotland.

Names of Places.	Latitude		Longitude	
	D.	M.	D.	M.
Sky Island, North End	57	40	05	21
Island Lewis North End	58	20	07	02
Farrp Head	58	23	05	05
Schotland South End	60	02	03	00
Fair Isle	59	30	03	20
Isles of Orkney	59	10	03	32
Cath Nefs	58	47	02	06
Buchan Nefs	57	55	00	58
Aberdeen	57	12	01	55
Dundee	56	26	02	47
Leith	56	00	02	55
Berwick	55	50	01	35

North Latitude.

West Longitude.

The Coasts of England from Berwick to the Lizard.

Names of Places.	Latitude		Longitude	
	D.	M.	D.	M.
Newcastle	54	58	01	30
Shelles	55	02	01	22
Sunderland	54	52	01	20
Hartlepool	54	40	00	55
Whitby	54	35	00	40
Scarborough	54	20	00	03
Tamborough Head	54	08	00	11
Burlington	54	00	00	06
The Spurn	53	35	00	13
Hull	53	45	00	28
Grimsby	53	39	00	56
Boston	53	09	00	10
Linn	53	59	00	29
Wells	53	07	01	00
Blackney	53	24	00	55
Cromer	53	10	01	07

North Latitude.

West Longitude.

East Longitude.

The Mariners Compass Rectified.

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The Coasts of England, from Berwick to theizard.

Names of Places.	Latitude		Longitude.	
	D.	M.	D.	M.
Winterton				
Warmouth	53	02	01	24
Alborough	52	45	01	38
Orfordness	52	24	01	25
Ipswich	52	20	01	11
Harwich	52	14	01	00
Colchester	52	11	01	18
London	52	04	00	58
Roche:er	51	32	00	00
Margat	51	28	00	25
The North Foreland	51	29	01	10
Sandwich	51	21	01	10
The Downs	51	27	01	09
The South Foreland	51	25	01	21
Rippras	51	12	01	20
Dover	51	53	01	25
Dongeness	51	15	01	18
Rye	51	00	00	51
Beachy	51	03	00	45
Shorarn	50	48	00	19
Portsmouth	50	55	00	17
Isle of Wight	50	48	01	00
Pool	50	58	01	06
Weymouth	51	00	01	50
Portland	50	43	02	40
Chiddock	50	30	02	48
Lime	50	47	03	00
Topsham	50	45	02	14
The Berry	50	37	03	27
Torbay	50	25	03	49
Dartmouth	50	32	03	38
The Start Point	50	27	03	36
	50	07	03	45

East Longitude.

West Longitude.

North Latitude.

The Sea Coasts of England

Names of Places.	Latitude		Longitude	
	D.	M.	D.	M.
<i>The Eddyston</i>	50	12	04	20
<i>Plymouth</i>	50	36	04	13
<i>Ramhead</i>	50	14	04	35
<i>Foy</i>	50	25	04	30
<i>Falmouth</i>	50	12	05	12
<i>Lizard</i>	50	00	05	24

The Sea-Coasts from the Lizard to Holy-Head.

Names of Places.	Latitude		Longitude	
	D.	M.	D.	M.
<i>Lands-End</i>	50	06	05	58
<i>Gulf</i>	50	00	06	06
<i>Scilly Islands, the middle</i>	50	00	06	45
<i>Seven Stones</i>	50	10	06	40
<i>Hartland Point</i>	51	06	04	35
<i>Londey Isle</i>	51	20	04	40
<i>Mort Bay</i>	51	12	04	40
<i>Bristol</i>	51	32	02	40
<i>Swansey</i>	51	40	04	25
<i>Caldy Island</i>	51	33	05	14
<i>Milford</i>	51	45	05	15
<i>St. David's Head</i>	52	00	05	22
<i>Barfey Isle</i>	52	43	05	10
<i>Leverpoole</i>	53	20	03	10
<i>Westchester</i>	53	37	04	20
<i>Lancaster</i>	54	40	03	35
<i>Whitehaven</i>	54	10	03	50
<i>Isle of Man, Westend</i>	53	45	05	00
<i>Holy-Head</i>	53	24	05	00

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Sea-Coasts of Ireland.

Names of Places.	Latitude.		Longitude	
	D.	M.	D	M.
Fair Foreland	55	05	06	30
London-Derry	54	55	08	00
Island Torre	55	08	08	30
Isles of Arran	54	48	08	59
Stags of Broad Haven	54	07	10	05
Isles of Arrian	54	55	09	50
Galloway	53	05	09	20
Gally, or Doen's Head	52	40	09	30
Lupis's Head	52	24	10	11
Limrick	52	24	09	20
Blasques	52	00	11	55
Skillocks	51	30	11	55
Cow and Calf	51	22	10	36
Mixan Head	51	15	11	30
Old Head of Kinsale	51	35	08	58
Cape Clear	51	10	10	30
Kinsale	51	50	09	40
Cork	51	50	09	30
Waterford	52	10	08	28
Wexford	52	13	07	38
Dublin	53	22	07	30
Lambay	53	24	07	30

North Latitude

West Longitude

The Sea Coasts of France.

Calis	51	00	01	50
Diep	50	00	01	00
St. Valery	50	10	00	56
Sain Head or Cape de Antifer	49	44	00	24
Roven Mouth	49	36	00	30
Cape Berfleur	49	47	01	12
Cape de la Hague	49	50	02	00

North Latitude

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The Mariners Compass Rectified.
Sea Coasts of France.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Alderney	49	50	01	47
Caskets	49	50	02	05
Guernsey	49	36	02	35
Jersey	49	20	02	19
St. Maloes	48	25	01	05
Morlaix	48	34	03	49
Island de Bass	49	00	04	00
Ushant	48	30	05	19
Conquet	48	25	05	05
Brest	48	25	04	44
Camaria Bay	48	25	04	28
Seams	48	04	05	01
West Penmarks	47	45	04	24
Bell Isle	47	09	03	20
Nants	47	15	01	49
Heys Isle	46	24	02	14
Isle de Rey	46	00	01	30
Oleron	46	00	00	34
Roebel	46	10	00	30
Bourdeaux City	45	10	00	30
St. Sebastian	43	30	01	25
Bilboa	43	35	02	54
Cape Pinas	44	44	06	00
Cape Ortegal	44	00	07	30
Cape Coruna or Groin	43	28	09	20
Cape Finistere	43	10	10	30
Isles of Bajona	42	22	09	24
Burlings	39	43	10	52
Rock of Lisbon	39	00	10	18
Lisbon	39	08	10	20
Cape St. Vincent	37	00	10	35
Cape St. Maria	36	55	09	18
Cadiz	36	18	07	00

North Latitude.

West Longitude.

The Coasts on the Main Continent within the Straits

Names of Places.	Latitude		Longitude	
	D.	M.	D.	M.
Gibraltar	36	10	07	00
Malaga	36	50	03	17
Cape de Gat	36	47	01	15
Cape Paul	37	38	00	17
Alicant	38	30	00	35
Cape Martin	38	46	00	56
Barcelona	41	20	02	05
Marseilles	43	12	05	20
Toulon	43	05	05	40
Genoa	44	25	09	10
Leghorn	43	28	11	39
Civita Vecchia	41	46	12	00
Rome	41	50	13	03
Naples	41	08	15	47
Cape Spatarvento	38	00	16	52
Cape Colonne	39	10	18	06
Gallipoli	40	08	20	00
Cape St. Maria	39	52	19	29
Ancona	43	35	15	06
Venetia	45	17	12	35
Zara	44	05	17	15
Danio	42	57	22	47
Ragusa	42	39	20	06
Cattaro	42	31	20	05
Antivara	41	49	25	30
La Valona	40	57	21	24
Point Palermo	40	05	21	40
Lepanto	38	20	22	30
Cape Matapan	36	28	22	49
Cape St. Angelo	37	00	24	28
Athens	38	00	25	23

North Latitude.

East Longitude.

West Longitude.

The Coasts on the Main Continent within the Straits.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Cape Marzolo South Point of Negropont	38	05	27	50
Cape Coloni	37	30	25	25
Cape Monte Janeto	40	00	26	59
Galippoli	40	20	29	05
Constantinople	41	06	31	50
Cape Barbaros	39	00	28	21
Smyrna	38	26	28	30
Cape Barhernola	38	05	27	30
Ephesus	37	35	28	17
Antiochetta	36	30	35	25
Scanderoun	36	25	39	40
Forzosa	35	18	39	35
Antiocha	35	54	39	20
Tripoly	34	30	39	10
Joppa, or Jaffa	32	32	37	15
Cairo	30	05	34	20
Alexandria	31	05	33	04
Cape Rufato	33	28	24	12
Cape Misarato	33	18	19	56
Tripoli	32	55	13	17
Suffa	36	00	10	43
Cape Bona	37	05	10	47
Tunis	36	50	10	00
Bona	37	09	07	00
Gigeria	37	03	05	12
Cape Tadelles	37	08	04	00
Algier	36	40	03	30
Cape Tones	36	30	02	34
Oran	35	46	01	05
Cape Tres Forcas	35	37	01	36
Cruza	35	37	03	11
Tangier	35	26	04	19

North Latitude.

East Longitude.

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The Mariners Compass Rectified.

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Islands within the Straights.

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M.

Names of Places.

Latitude. Longitude.
D. M. D. M.

East Longitude

East Longitude.

North Latitude.

Formentura	38	44	03	30
Corica	39	05	03	33
Majorca	39	38	04	18
Minorca	39	55	05	32
South end of Sardinia	38	46	09	10
North end of Sardinia	41	00	10	01
Asinara	41	00	09	50
South end of Corsica	41	20	10	17
North end of Corsica	42	55	10	28
Capraia	42	58	10	57
Gilbo, or Elba	42	31	11	12
Isola	42	07	11	09
S. Christo	41	55	11	27
Almarolla	40	50	12	55
Isola	40	40	15	00
Cia, or Eschia	40	46	16	12
Strombello	39	00	16	38
Vulcanello	38	48	16	06
St. Peter	38	43	15	57
St. Paul	38	45	16	13
Sicilia	38	50	15	34
West end of Sicilia	37	32	14	43
Middle of Sicilia	37	42	16	45
East end of Sicilia	37	07	18	00
St. Stefano	38	07	16	57
St. Stefano	37	10	16	55
St. Stefano	36	53	14	00
St. Stefano	36	20	14	41
St. Stefano	35	58	14	05
St. Stefano	35	46	14	15
St. Stefano	36	45	16	57
St. Stefano	36	00	16	00
St. Stefano	44	00	15	22

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Islands within the Straits.

Names of Places:	Latitude.		Longit.	
	D.	M.	D.	M.
Poma	43	34	16	00
St. Andrea	43	07	16	04
Lissa	43	06	16	09
Augusta	42	56	16	39
Corzola	42	53	16	14
Melada	42	37	17	39
Corfu	39	45	26	42
Cephalonia	38	15	21	49
Zant	37	47	22	14
Sapienza	36	47	22	52

Islands in the Archipelago.

Rasso	40	00	27	55
Lemnos	39	41	28	25
Mitelin	38	54	29	18
Mitilino	38	28	28	57
Siatta	39	00	26	45
Tino	37	25	27	49
Sia, Sea, or Sira	37	18	27	37
Femenia, or Fermina	37	28	27	54
Serfanto, or Sifanto	36	58	27	15
Millo, or Mllo, or Mela	36	40	27	16
West end of Candia	35	15	25	01
East end of Candia	35	24	28	38
Rhodes	36	40	29	38
West end of Cyprus	34	22	33	23
East end of Cyprus	34	48	36	14

The Sea Coasts of Barbary and Guiney, from Tangier to Cape Bon-Esperance.

Cape Sparid	35	30	04	35
Salle	33	45	04	15
Cape Causen	32	17	09	00
Cape de Geer	30	10	10	50

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The Sea Coasts of Barbary and Guiney, from Tangier to Cape Bona Esperance.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Cape de Non	28	52	11	30
Cape Bojador	26	55	15	16
Cape Blanco	20	35	17	10
Cape de Verd	14	30	16	55
River of Gamboa	13	17	15	41
Cape Roxo	11	38	14	37
Cape de Monte, or Mount	06	23	10	05
River Sesser	05	20	07	36
Cape de Palmas	04	00	05	00
River S. Andrea	05	00	03	15
Cape Corce	04	40	03	10
Cape Three Points	04	10	01	36
River de Valis, or Accara	05	25	04	48
River de Lagar, or Ardu	07	00	06	35
River Beamin	07	10	08	48
Cape Formosa	04	05	10	28
New Calabar Entrance	04	10	11	13
Old Calabar Entrance.	04	20	12	20
Sampsons River	04	00	13	08
River de Camarones	03	10	14	15
Island Fernandepo	02	40	13	40
Island de Prinsis	01	50	12	20
River de Anger	01	00	14	00
Island Cabos	00	40	11	36
Island St. Thome	00	00	11	00
Island St. Matthews	01	40	07	11
Island Ascension	08	10	21	45
Island Anabona	02	03	10	32
Cape Lopez	01	00	13	07
Cape Negro	16	30	14	11
Island St. Helena Nepa	16	03	05	14
Island S. Helena	16	05	06	10

The Sea Coasts of Barbary, and Guiney, from Tangier to Cape Bona Esperance.

Names of Places.	Longit.		Latitude.	
	D.	M.	D.	M.
Cape Secot, or Sego	29	40	14	55
Cape Bon Esperance	54	25	17	00
Cape Angullas, or Lagullas	36	00	18	30
Island Garvice	37	54	07	40
Island Trifhian	36	57	07	10

Sea Coasts of Brazil.

Names of Places.	Longit.		Latitude.	
	D.	M.	D.	M.
Island St. Paul	01	50	24	20
Para	02	50	37	55
Cape S. Roque	05	00	36	25
Rio Grande	05	30	36	45
ernambuc	08	15	36	50
Cape St. Augustin	08	50	36	45
Island Ferdinandado Loxombo	03	40	33	00
River St. Francisco	10	45	38	30
Bay de Todos Santos	13	00	41	00
River St. Antonio, or River Grande	15	40	42	10
Cape de Abrolhor	17	50	42	15
Quito Santo	19	55	42	20
Cape St. Thomas	22	10	42	00
Cape Frio	22	40	42	30
Island St. Katherine	28	00	50	00
River Grande	31	55	54	00
Cape S. Maria	34	30	57	20
River de Palato, or Cape St. Antonio	36	35	57	30
Cape de St. Andreas	38	50	63	31
Bay Sinfrido	42	45	69	00
Point de los Canes	44	10	70	00
River Camarinas	46	30	71	50
Cape Blanco	47	10	71	00
Point of River St. Julian	48	40	74	20
Cape Vin Mary of Malg. Straits	51	50	79	30
Le Maire Straits	55	50	79	30

Sea Coasts of Brazil.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
C. Horn, the S. part of Terra Del Fuego	57	50	79	55
Island dos Picos	22	30	13	45
Island de Martinvas	19	30	23	05
Island St. Maria de Agosta	18	40	23	10
Island Trinitada	20	30	30	00
Island Ascension	19	20	33	25
Port Segura	16	00	41	30

Sea Coasts on the Main Continent in the East-Indies.

Bay de Allagoor Dallagoa	15	18	31	05
River St. Lucia	30	25	30	15
Cape S. Martin, or Maria	22	40	35	05
Cape Corantes	22	50	35	23
Mozambique	15	04	40	30
P. de Agnada, or del Gada	15	17	40	12
Cape Falso	09	00	38	50
Tongon	05	10	39	07
Mombaso	04	15	38	30
Molinde	03	00	40	00
River de Lamos	01	20	40	15
Magadexa	02	00	44	20
Cape de Bassas	04	00	49	15
Cape de Gradafui	11	10	52	30
Aden	13	00	48	00
Mocha	13	40	46	10
Cape de Masriara	15	23	53	10
Defar	17	00	54	45
Cape Rasulgat	22	27	60	45
Mascari	23	32	59	45
Bafora	30	00	49	05
Sambagroom	27	30	56	45
Cape Glado	25	50	03	44

The Coasts on the Main Continent in the East-Indies.

Names of Places.	Latitude		Longitude	
	D.	M.	D.	M.
River de Sinda	25	00	07	25
Diu Head	20	45	70	23
Surat	21	00	73	02
Daman	19	59	73	37
Bombay Island	19	00	73	15
St. John's	19	55	73	20
Chaul, or Choale	18	30	73	47
Dabul	18	01	74	01
Rajapore Isle	16	45	74	20
Carwer	14	37	75	00
Goa	15	20	74	37
Manguber	12	40	75	55
Tellecherry	11	42	75	20
Calicut	11	15	75	54
Camnanou	10	20	76	02
Cochin	10	00	76	45
Anjanga	08	30	77	35
Cape Commorine	07	50	78	45
Colombo in Zeyloan	07	07	80	00
Saint de Galle on the same	06	05	80	05
Dundre Head on the same	06	02	82	00
Greatsthas Shoals	06	23	83	30
Jatrapatam	09	55	81	40
Naga Patam	11	01	81	00
Trincumbar	11	15	81	15
Porta Nova	11	45	81	10
Fort St. David	12	05	81	13
Conymere	12	34	81	33
Fort St. George, or Madraffaparam	13	08	81	42
Pallacat	13	30	81	46
Armeton	14	15	81	43
Peropoly	16	05	82	05
Masulaparam	16	22	182	35

North Latitude

East Longitude

The Sea Coasts on the Main Continent in the East-Indies.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Massopare	10	30	83	30
Visapagatam	17	45	84	15
Bimlapatam	17	30	85	25
Pondy	18	45	85	55
Jacarnaut Pagod	19	30	88	10
Arjepure	20	10	88	25
Point Palmiras	20	46	88	35
Balafore	21	20	88	20
Piply	21	25	88	30
River Bengal	22	29	91	49
River Aracan	20	05	93	40
Pegn	18	00	95	40
Mallacca	02	21	101	20
Formosa	01	55	101	40
Point Romania	01	16	103	15
Point Cui	12	10	98	51
Siam Entrance	13	00	101	01
Cambodia Entrance	10	30	105	20
Cape Avarilla	12	10	109	03
Cochin, or Chinchin	14	35	109	00
Ponquin	21	20	106	40
Cantan	23	30	113	20
Amoye Island	24	30	116	55
Hocksew	26	40	118	23
River Swadia	27	45	118	40
Limpo, Lingpa, or Ningpo	30	16	120	05
Island Chusan	30	25	120	15
Nangin	34	40	120	25

Islands in the East-Indies.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Romanas de Castelameis	28	39	66	51
St. Joande Lisbon	26	04	53	38
Diogo Roys	20	00	61	30
St. Brannam	26	00	64	10

Islands in the East-Indies.

Names of Places.	Latitude.		Longir.	
	D.	M.	D.	M.
Mauritias	20	10	54	50
Digo Rais	20	00	61	10
Malha	11	15	60	30
South end of S. Laurence	26	07	46	20
North end of S. Laurence	12	03	50	45
John de Nova	17	30	42	35
St. Christova	17	00	43	39
Mayotta	13	10	45	35
Joanna	12	19	44	49
Mabilla	12	15	43	41
Comaro	11	50	43	44
Morsia	07	50	42	14
Zanzibara	07	00	39	45
Pinda	05	19	39	36
John de Comaro	09	30	44	56
Cosmelodo	10	00	5	08
John de Nova	09	30	52	32
Affore Isle	09	45	54	08
Agalega	09	30	54	11
Seres-Hermanus	03	47	52	54
Island Quevela	03	49	52	36
Hermanos	03	32	54	01
Island Gratio	06	43	63	31
Padra Banbas	07	10	66	51
Bassas de Obages, or Island de Obages	07	20	70	05
Three Germans	4	30	62	33
Cross Island	4	31	57	50
Macatra	12	28	55	37
Island Abdisyre	12	12	54	25
Abello	08	23	71	45
Malique	09	00	73	15
Gripe, or Gripe	10	40	72	52

East Longitude.

North Latitude.

Islands in the East-Indies.

Names of Places.	Latitude.		Longitude	
	D.	M.	D.	M.
Qualpene	10	30	74	00
Andamaon or Anasada	11	10	73	37
Ceyloan, South-end	05	50	82	15
Maldiva South-part	01	00	76	15
Maldiva North-part	07	10	73	05
Xas de Digo Rayes	00	25	72	05
East-end of Anam	19	55	116	00
Anam West-end	19	30	113	10
Island Cocos	14	10	91	38
Island Andaman	13	00	91	25
Borneo	04	30	116	10
Nicobar Island	11	10	91	40
North-end of Sumatra	05	28	93	45
South-end of Sumatra	05	42	104	14
Jambe	01	19	108	00
Bantam	05	55	110	19

The Southern Islands, or Cape de Verd Islands.

St. Antonio	17	17	25	40
St. Vincent	16	55	45	36
St. Lucia, or Round Island	16	50	25	12
St. Nicholas	16	30	24	18
Isle de Sall	17	00	22	13
Bonavista	15	58	22	10
Maye, or Island May	15	00	22	16
St. Jago	14	55	23	16
Fuoge	14	42	24	00
Brava	14	29	24	38
St. Paul	01	05	24	20

The Canary Islands.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Porto Santo	33	00	16	00
Madera West-end	32	17	17	05
Salvages	30	05	16	55
Palma	28	58	17	46
Ferro	28	05	17	52
Gomera	28	09	17	30
Tenariff	28	20	17	05
Grand Canaria	27	53	16	05
Alleganza	29	11	12	07
Lancerotta	28	51	12	21
Forteventura	28	00	13	22

The Western Islands.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Corvo	40	09	32	23
Flores	39	40	32	19
Fyal	38	59	30	37
Pico	38	30	29	00
St. George	39	00	28	24
Forca	39	20	27	16
Gratia	39	30	28	15
Abrajo, or Vega	39	52	24	17
Vago, or Vega	38	43	23	47
St. Michael	38	00	23	20
Formigas, or Hormigas	37	25	24	10
St. Maria	37	00	24	20

The Sea Coasts of the North part of America, Hudson Bay, and Newfoundland.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Cape Farewell	60	10	47	00
Cape Elizabeth	62	00	67	50
Island Resolution	61	40	67	50
Queen Anns Foreland	63	30	75	45
Salvages Island	62	30	71	00
Salisbury Island	63	40	77	30
Mill Isles	64	20	80	20
Nottingham Isle	62	40	80	25

The Sea Coasts of the North Part of America, Hudson's Bay, and Newfoundland.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Dark Point	64	30	83	45
Cape Southampton	62	00	88	55
St Thomas Roes Wellcome	64	15	92	10
Cape Churchill	59	00	93	50
Fort Nelson, or York Fort	57	10	93	55
New Severn	56	00	88	50
Cape Henricus Maria	55	10	85	10
Waters Isle	53	05	84	40
Stony Rivers Mouth	52	25	85	15
Goose River Mouth	51	00	84	40
Point Comfort	51	30	83	10
Smithman's River	51	10	82	05
Cuperts River	51	20	81	50
Bacon's Island	52	10	82	50
Manby Island	52	05	82	40
Depards Island	51	30	82	18
Solomon's Temple Island	53	05	82	24
Easton's Isle	52	58	82	40
Abbs Isle	54	10	83	50
Waters Islands	54	35	84	15
Waters Dozen Isles	57	55	86	40
Waters Isles	60	20	86	28
Watersfield Isle, the middle	62	20	87	30
Cape Jones	55	00	86	40
Cape Walsingham	63	30	79	10
Cape Charles	62	35	76	15
Waterson's Isles	60	30	67	30
Waters Island	52	00	55	35
Waters Island	50	35	53	45
Cape St. John	50	20	53	10
Waters Island	50	15	53	10
Cape Bonavista	40	20	53	10

West Longitude.

North Latitude.

The Sea Coasts of Hudson's Bay, Newfoundland, and New England.

Names of Places.	Latitude.		Longitude.	
	D.	M.	D.	M.
Trinity Bay Entrance	48	50	53	28
Bacalecan Island	48	39	53	19
Conception Bay Entrance	48	20	53	13
Cape St. Francis	47	44	52	31
Cape Race	46	28	52	54
Bay of Bulls	47	40	52	33
St. John's Harbour	47	38	52	43
Cape St. Maria	47	20	54	20
Placentia Bay	47	53	54	05
Cape St. Laurens	47	25	54	23
Island St. Paul	47	10	58	22
Cape Roy	48	05	58	10
Virgin Rocks	46	10	51	10
French Factory	50	10	61	15
Bay of Brift	52	10	54	43
Tedafack	49	00	64	25
Quabek	47	10	65	55
AntiCosti Island	47	35	60	30
E. S. Charles, or Charles Straits	52	17	55	00
Cape Britain	46	30	58	25
Cape Sable, or Island Sable	43	35	63	30
Point, or Port Royal	44	30	63	00
Penobscut River	44	20	66	20
North Yarmouth	44	08	67	43
Pascatoway Entrance	43	20	67	55
Cape Ann Island	42	42	67	43
Cape Codd	42	10	67	55
Boston Entrance	42	30	69	10
Plymouth	42	08	68	00
South End of S. George's Bank	41	35	66	33
South End of Vantackit Shoal	40	05	66	50
Nantucket Island	40	45	67	40
Marshall's Vinyard	40	50	67	40

North Latitude.

West Longitude.

Sea Coasts on the Main Continent in the *West-Indies.*

Names of Places.	Longitude		Latitude	
	D.	M.	D.	M.
Elizabeth's Island	41	20	67	35
Block Island	40	55	68	40
Oyster Point	41	00	69	20
Fishers Island	41	12	69	40
New York	40	50	73	10
Sandy Point	40	25	73	22
Cape James, or Henlopen	39	08	74	30
Long Island, the middle	40	40	70	40
Cape May	39	15	74	09
Cape Charles	37	18	74	45
Cape Henry	37	00	75	02
Cape Hartaras	35	10	75	00
Cape Fear	33	32	77	20
Cape Roman, or Catris	32	50	77	55
Island Bermudas, or Summer Island	32	30	64	00
Ashly River, or Charles Town	32	40	78	50
Port Royal	32	00	79	55
Cape Florida	24	46	81	55
Lapillapina, or Apalachia	29	47	85	48
River Spiritus Sancto, or Mischi- sippi Rivers Mouth	28	30	96	10
Tompock	22	25	100	30
Lava, or Vera Cruz	19	15	100	40
Saira, or Cape St. de Martin	19	10	99	30
Triste Island	18	15	94	35
Campecha	19	20	93	25
Cape Condeseo	20	50	92	50
Cape de Cutocha	21	23	89	15
Salamanca	17	00	92	30
Cape Honduras	16	25	88	40
Cape Carmaran	16	20	86	55

North Latitude.

Longitude.

Coasts on the Main Continent in the West-Indies.

Names of Places.	Longitude		Latitude	
	D.	M.	D.	M.
Entrance of Nuoragua	11	15	85	30
Darien, or Scotch Settlement	09	05	78	40
Carthagena	11	00	75	50
Cape Comuibaco, or Coquibaco	12	50	70	45
Island Curacao, or Quicasao	12	35	67	55
Island Margaritta	11	20	63	00
Island Trinidad	10	00	59	55
Mouth of Oronoque River	08	15	59	05
Cape Three Points	10	30	62	10
Cape Nassau	08	05	57	45
North Cape, the middle of Caopory	01	50	49	55
Island	05	55	57	10
Suranani	01	35	49	48
Mouth of Amazonas River	01	35	SL	48

Islands in the West-Indies.

Tobago, the West-end	11	12	58	30
Barbadoes	13	10	57	54
Granda	12	07	59	50
Granadillo	12	30	59	45
Boquia	12	50	59	43
St. Vincent	13	10	59	42
St. Lucia	14	00	59	38
Martinica	14	50	58	45
Dominica	15	25	58	50
Marigallansa	15	55	58	45
Islandulaps	16	10	59	45
Deffenda	16	10	58	40
Atigua	17	00	59	40
Barbuda	17	48	59	33
Monserat	16	50	59	55
Redondo	16	51	60	10

Islands in the West Indies.

Names of Places.	Latitude		Longit.	
	D.	M.	D.	M.
Nevis	17	00	60	31
St. Christopher	17	13	61	00
Estatia	17	23	61	30
Saba	17	33	61	40
St. Bartholomew	18	00	61	07
St. Martin	18	05	61	13
Anguilla	18	08	61	20
Sambrero	18	30	61	20
Anegada	18	45	61	24
St. Gruz	17	42	62	52
Virgin	18	30	62	45
St. Thomas	18	30	63	22
St. John de Port Rico	18	30	64	46
Island Avis	15	39	61	56
Tortuga	20	15	72	34
Magaritta	11	20	63	09
Island Blanco	12	00	63	00
Island Tortugas	11	40	63	30
Island D'Orebila	12	09	64	00
Bonairy	12	22	65	38
Aruba	12	55	67	16
East end of Hispaniola	18	17	67	05
West end of the same	18	23	73	30
East end of Jamaica	18	00	75	10
Port Royal in Jamaica	17	55	76	10
West End of the same	18	08	79	00
East end of Cuba	20	20	79	00
West end of the same	21	40	86	30
La Bermudos	32	30	64	00
Babama Island	27	07	72	00
Abaco South end	25	47	77	38
Andrews North end	25	10	79	30
Providence	25	00	78	04

North Latitude.

West Longitude.

Islands in the West Indies.

Names of Places.	Latitude		Longitude	
	D.	M.	D.	M.
Harbour Island	25	35	76	57
Elisbera South end	24	18	75	43
Cat Island	24	18	75	43
Wasslings Island	24	00	75	05
Rum Key	23	45	73	25
Exuma	23	20	76	25
Hooked Island; North end	22	59	74	27
Long Island, South End	22	42	75	00
Armonds Keys	23	10	74	00
Mayaguania	22	32	73	24
French Keys	22	40	74	04
Merapervanz	21	58	75	05
Hogfish	21	20	74	10
Bluego West End	21	48	74	10
West Caicos	21	20	71	58
Turkey Island	21	13	70	33
Abrusbo Bank, the North End	21	40	69	00
Plains Wreck	20	25	68	30
Mucates	21	30	76	55
Island Verd	21	15	76	55
Cajal Zal	23	10	79	54
Island Pines	21	20	81	20
Island great Canains	18	46	81	28
Little Canains	19	10	80	24
Island of Providence	13	27	80	20
St. Andrew	12	32	80	31
Caimanback	19	10	81	00
Pedro Beals, North Side	17	10	80	15
Santula	17	15	81	40
Island St. Millan	17	00	82	38
Island Guayna	16	52	88	40
Island Orinelli	19	25	89	10

West Longitude.

North Latitude.



F I N I S.

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